US010879657B2

(12) **United States Patent**
Tsai

(10) **Patent No.: US 10,879,657 B2**
(45) **Date of Patent: Dec. 29, 2020**

(54) **BIDIRECTIONAL ELECTRICAL CONNECTION SOCKET, BIDIRECTIONAL ELECTRICAL CONNECTION PLUG AND COMBINATION THEREOF**

(71) Applicant: **Chou Hsien Tsai**, New Taipei (TW)

(72) Inventor: **Chou Hsien Tsai**, New Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 171 days.

(21) Appl. No.: **15/962,810**

(22) Filed: **Apr. 25, 2018**

(65) **Prior Publication Data**

US 2018/0248323 A1 Aug. 30, 2018

Related U.S. Application Data

(62) Division of application No. 15/304,774, filed as application No. PCT/CN2015/076904 on Apr. 17, 2015, now Pat. No. 9,960,551.

(30) **Foreign Application Priority Data**

Apr. 17, 2014 (CN) ..... 2014 2 0186527 U
May 23, 2014 (CN) ..... 2014 2 0268135 U
Feb. 17, 2015 (CN) ..... 2015 2 0114091 U

(51) **Int. Cl.**
H01R 24/00 (2011.01)
H01R 24/64 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H01R 24/64*** (2013.01); ***H01R 13/642*** (2013.01); ***H01R 24/60*** (2013.01); *H01R 13/658* (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H01R 24/64; H01R 24/60; H01R 13/658
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,198,563 B2 * 6/2012 Tsai H01R 24/62 218/140
9,142,926 B2 * 9/2015 Tsai H01R 27/00
(Continued)

FOREIGN PATENT DOCUMENTS

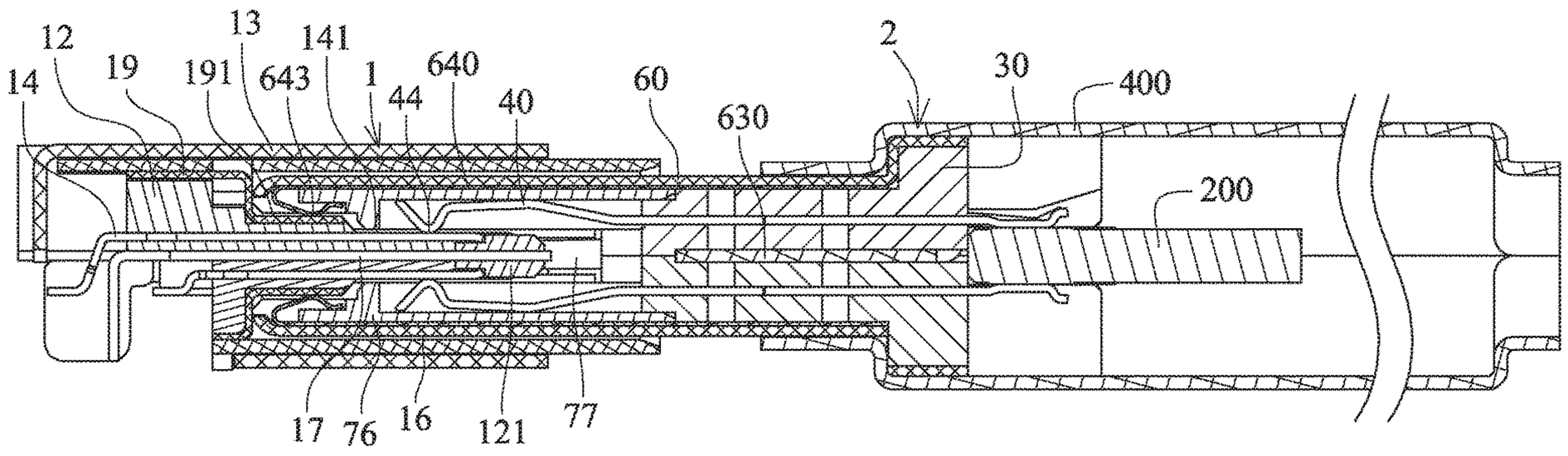
CN 201181784 Y 1/2009
CN 201812968 U 4/2011
(Continued)

Primary Examiner — Hae Moon Hyeon
(74) *Attorney, Agent, or Firm* — WPAT, PC

(57) **ABSTRACT**

Provided is a bidirectional electrical connection socket, to which a fitting portion of a bidirectional electrical connection plug can be inserted and connected, the fitting portion having two contact interface substrates, the bidirectional electrical connection socket including: an insulating base having one end formed with a tongue, each of two connection surfaces thereof has a contact interface formed by terminals; and a metal housing covering the tongue to form a connection slot, characterized in that the contact interfaces have connection points with circuit serial numbers arranged reversely, two fitting gaps between the contact interface substrates and the connection surfaces of the tongue are smaller than 0.15 mm, and the heights of the spaces on the connection surfaces are smaller than the large space of the standard electrical connection socket with the minimum height specification specified by USB Association, but greater than the small space of the standard electrical connection socket.

31 Claims, 23 Drawing Sheets



(51) **Int. Cl.**

H01R 13/642	(2006.01)
H01R 24/60	(2011.01)
H01R 13/658	(2011.01)
H01R 13/6582	(2011.01)
H01R 107/00	(2006.01)

(52) **U.S. Cl.**
CPC *H01R 13/6582* (2013.01); *H01R 2107/00* (2013.01)

(58) **Field of Classification Search**
USPC 439/676, 660
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0267282	A1*	10/2010	Tsai	H01R 24/62 439/607.17
2013/0157517	A1	6/2013	Liang	
2017/0279234	A1*	9/2017	Tsai	H01R 24/60

FOREIGN PATENT DOCUMENTS

CN	201956490	U	8/2011
CN	202094344	U	12/2011
CN	202111346	U	1/2012
CN	102340069	A	2/2012
CN	202405449	U	8/2012
TW	201039516	A	11/2010
TW	M419244		12/2011
TW	M443311		12/2012
TW	M448831		3/2013
TW	201401672		1/2014

* cited by examiner

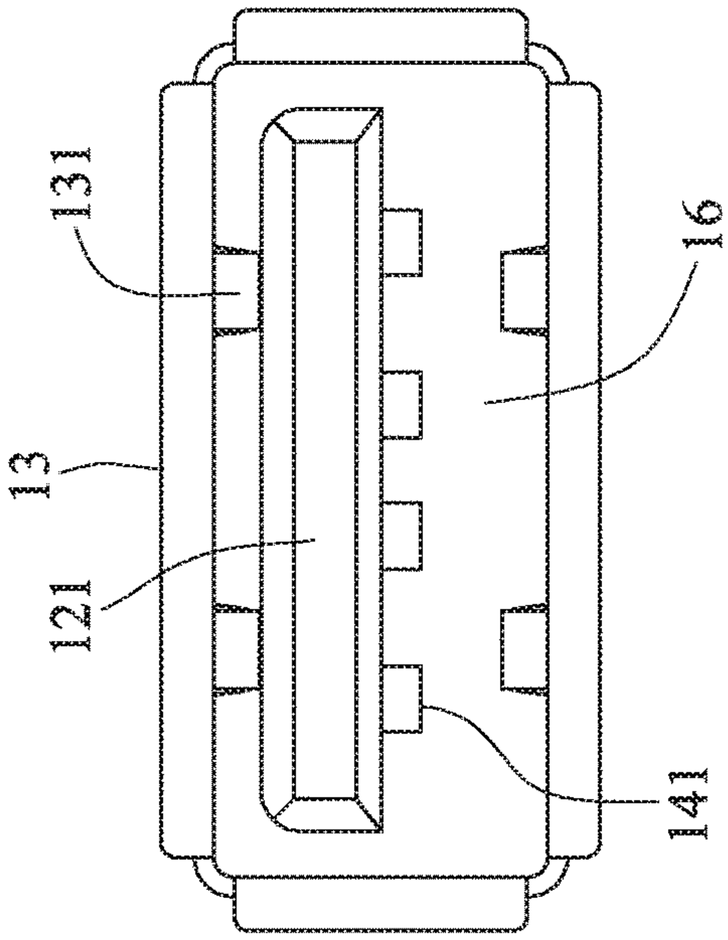


FIG. 2 (Prior art)

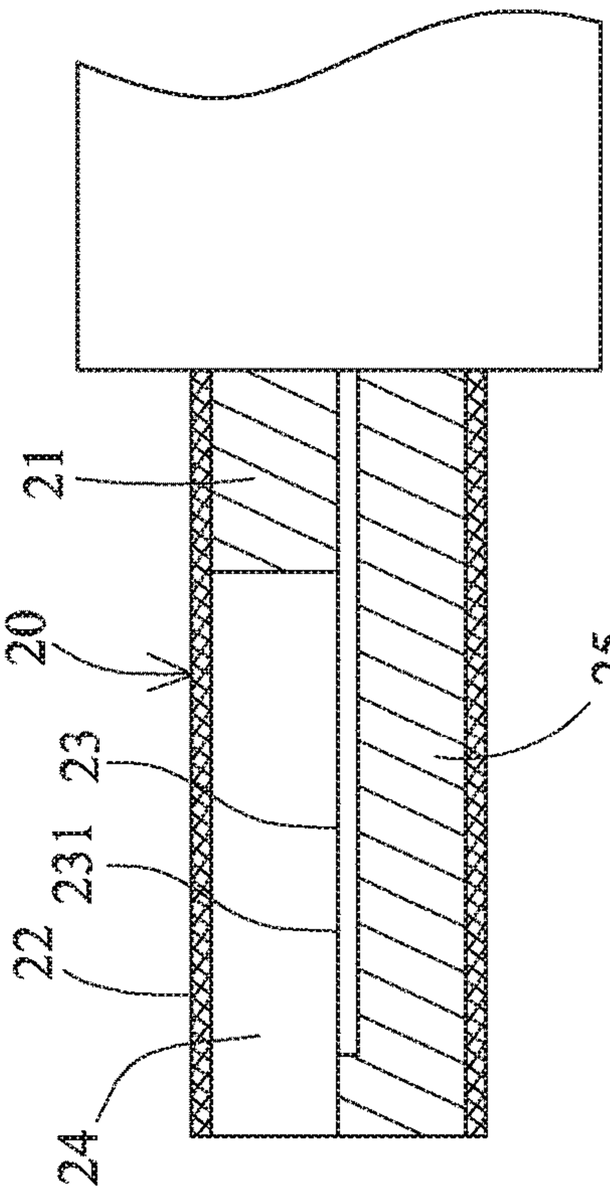


FIG. 3 (Prior art)

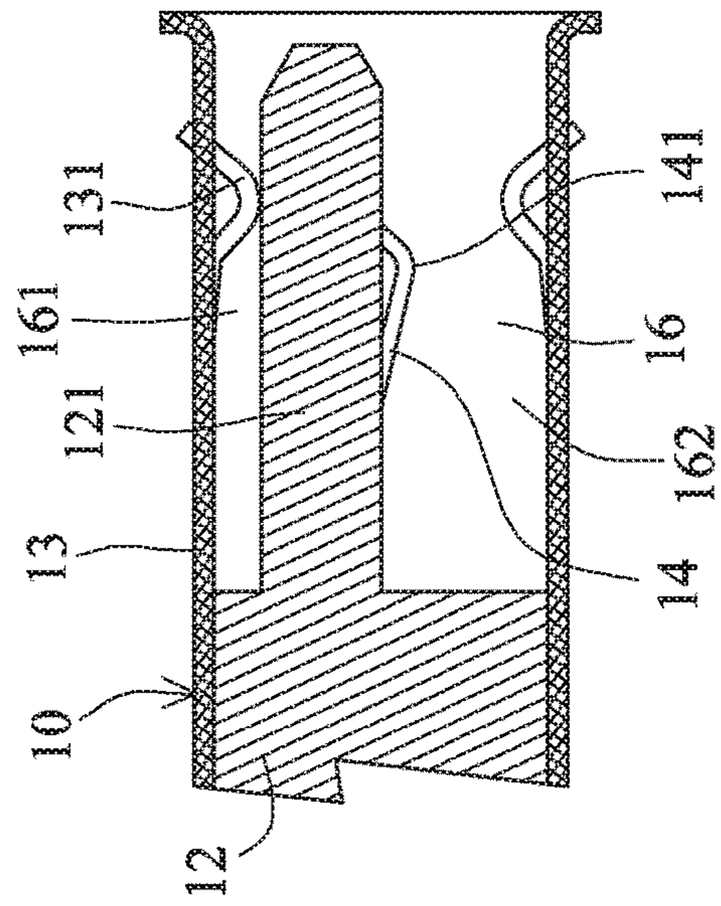
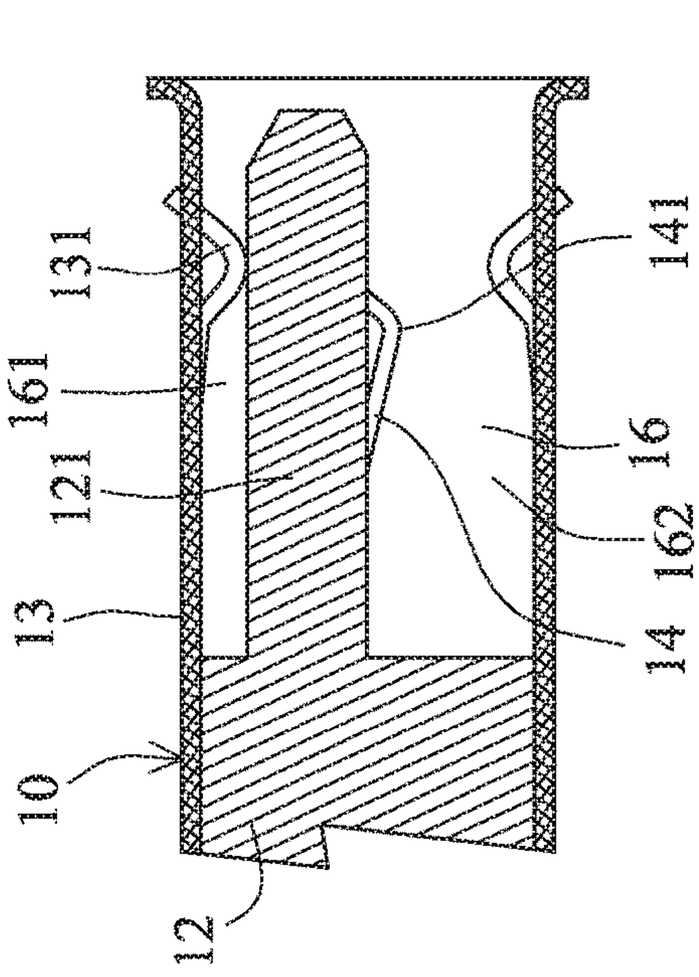
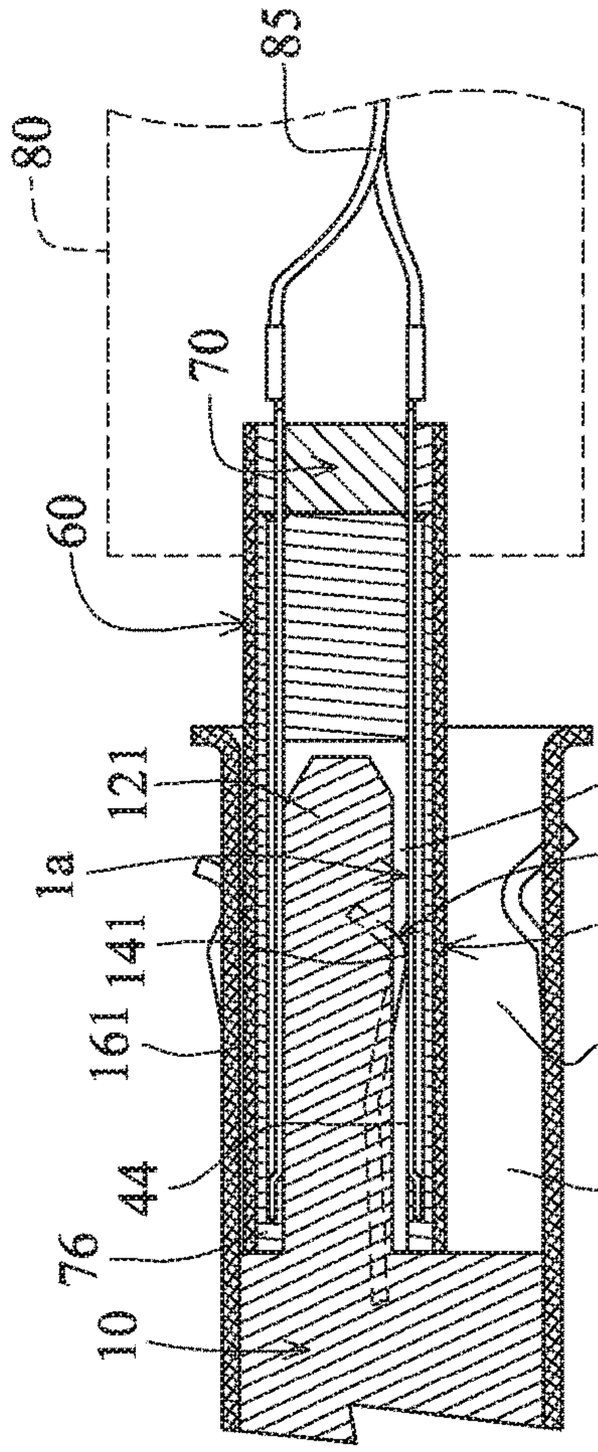


FIG. 1 (Prior art)





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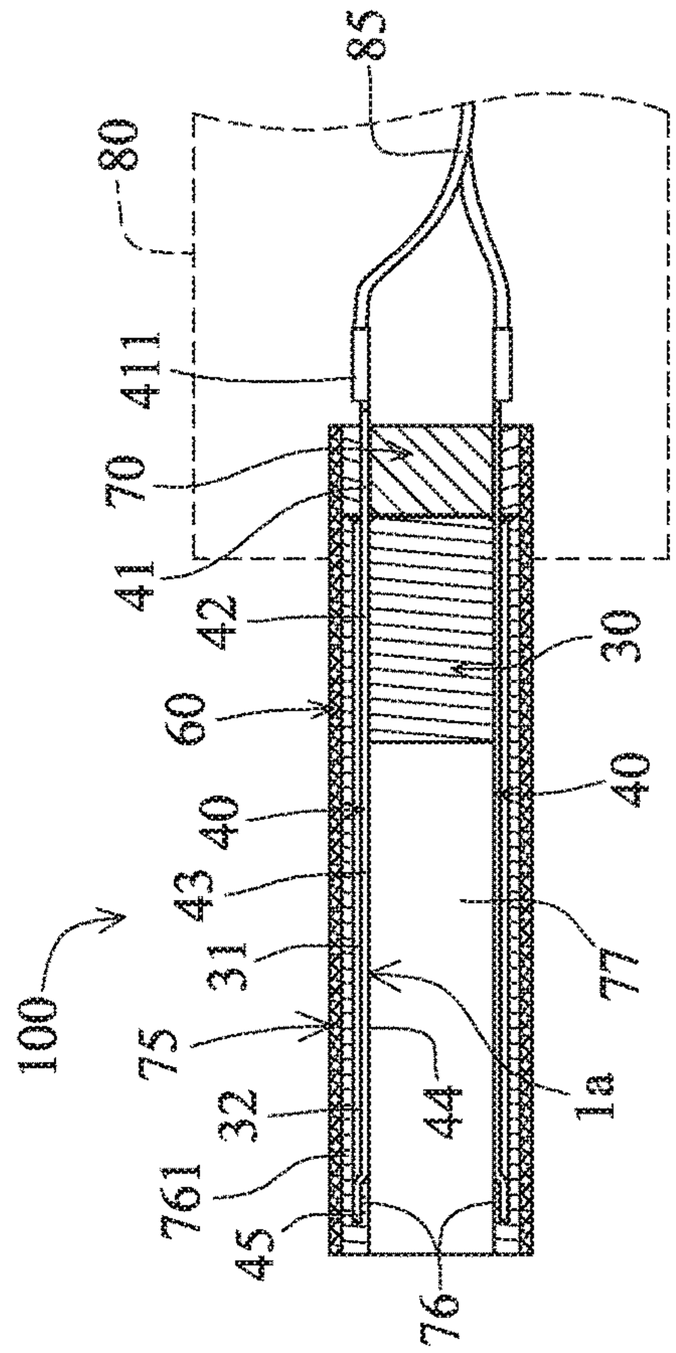

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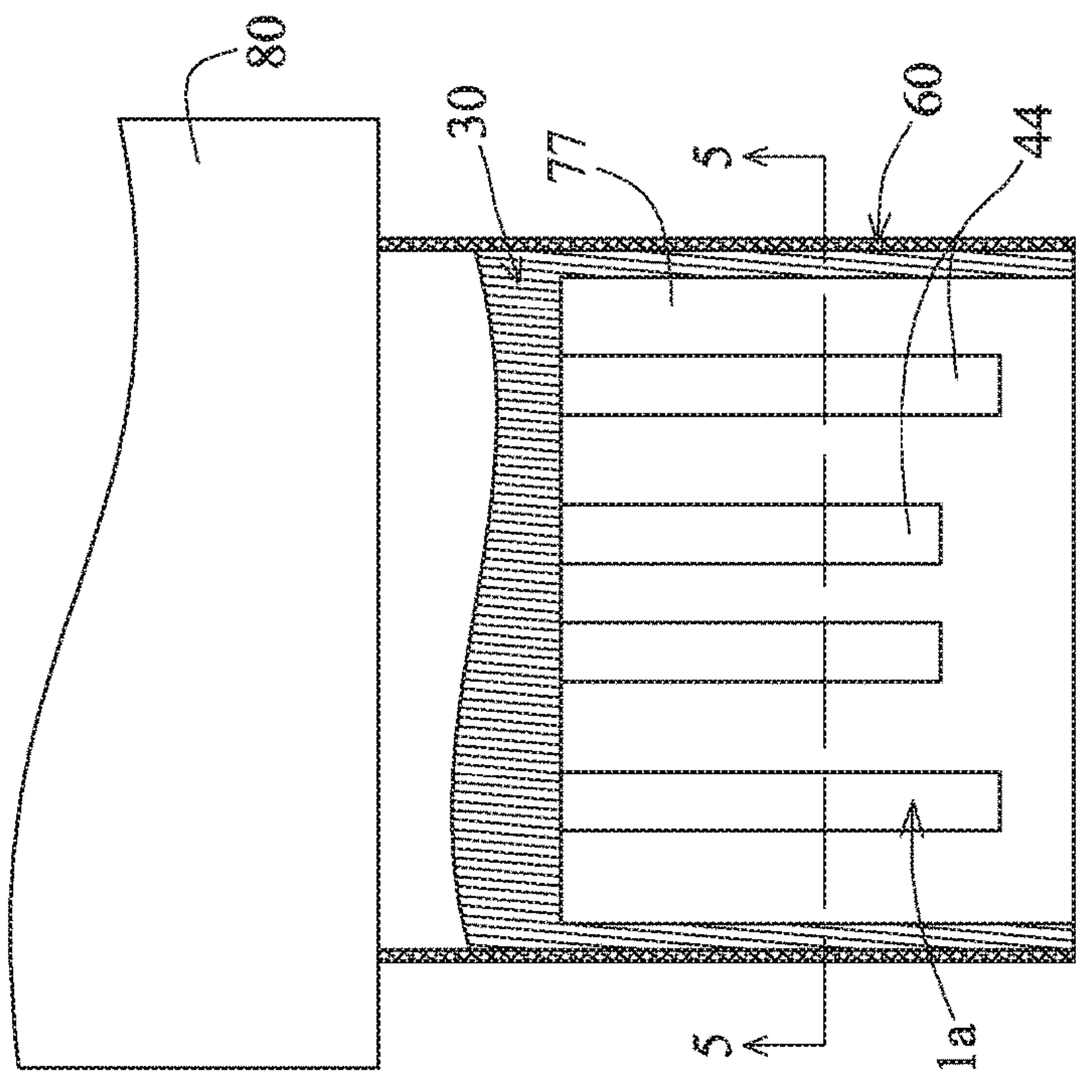

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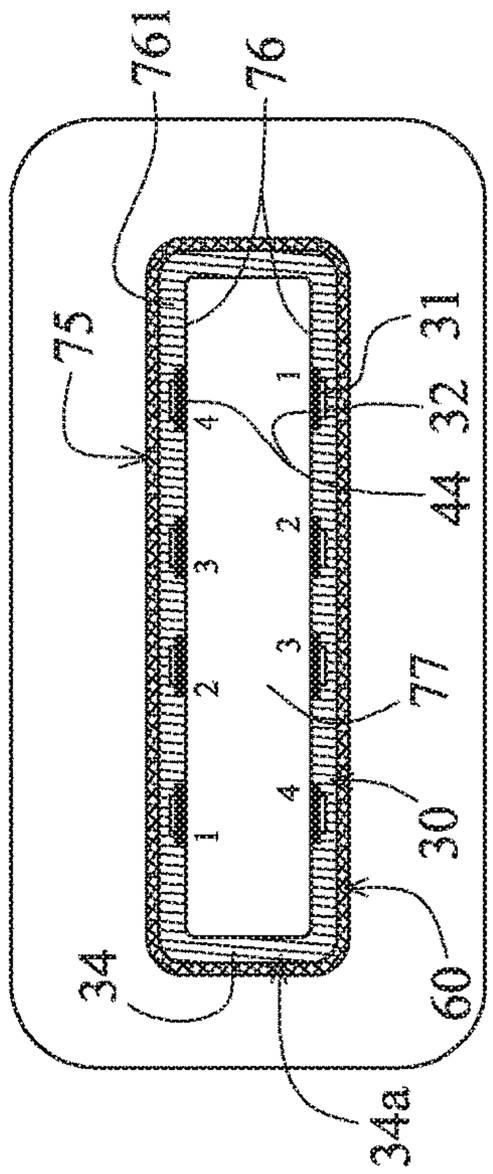

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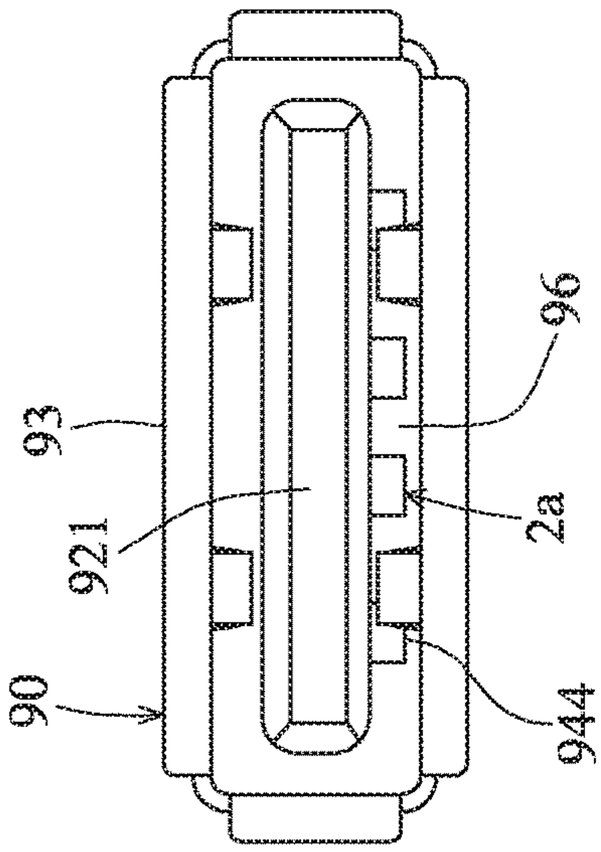

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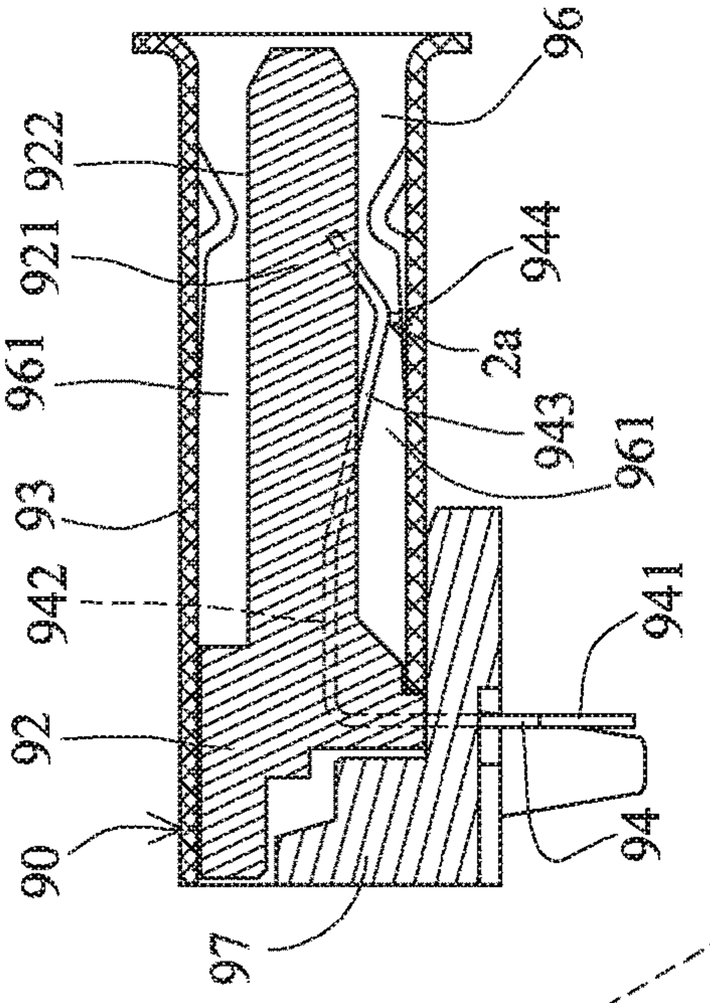

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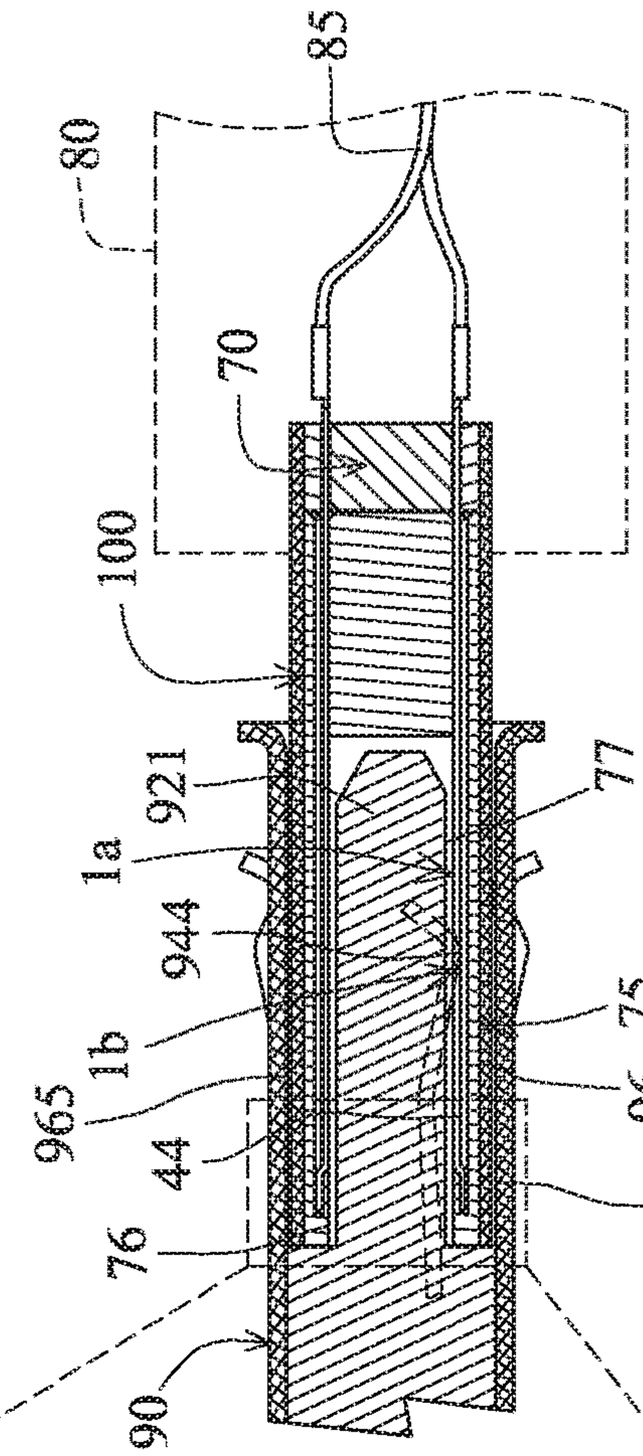

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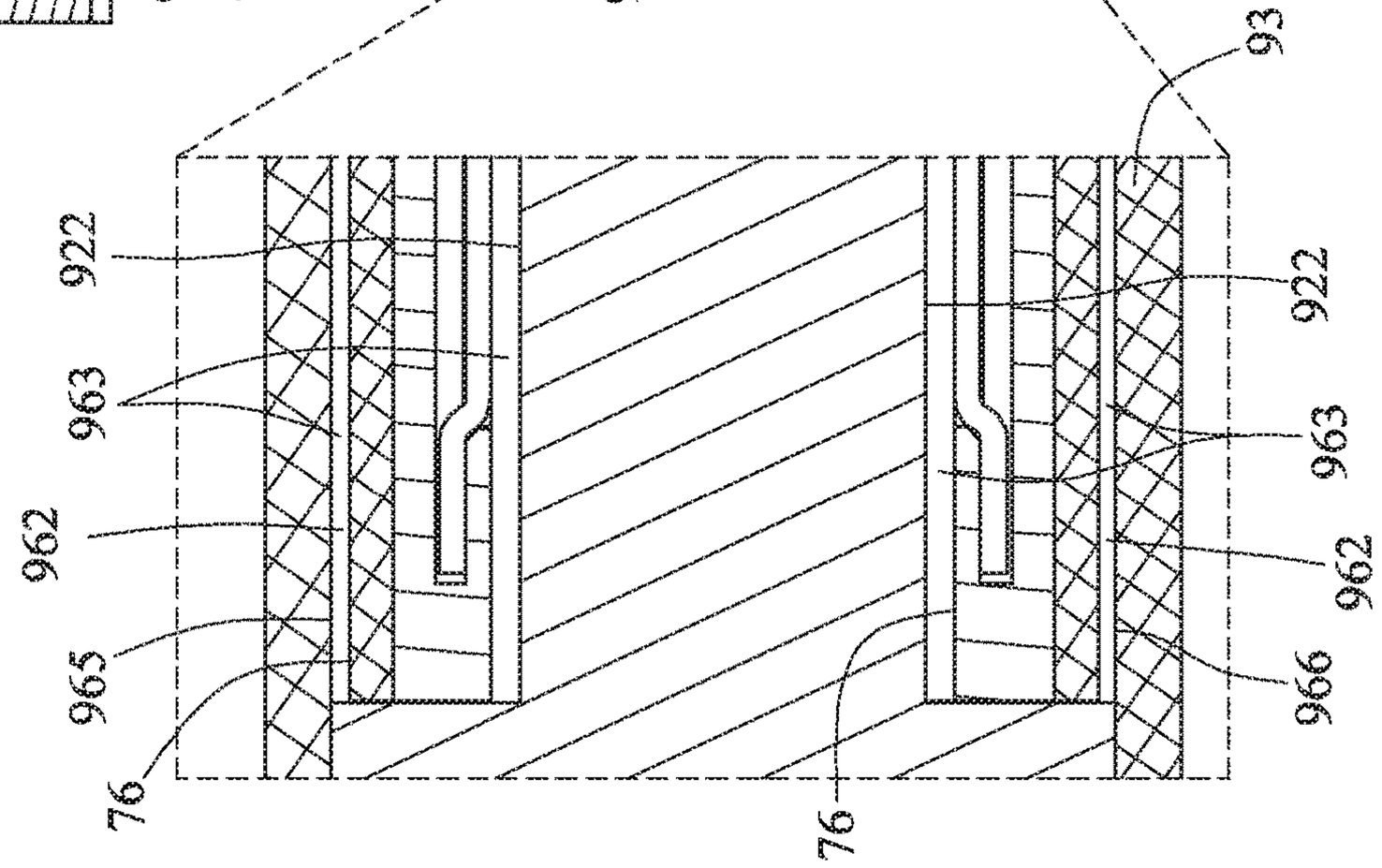

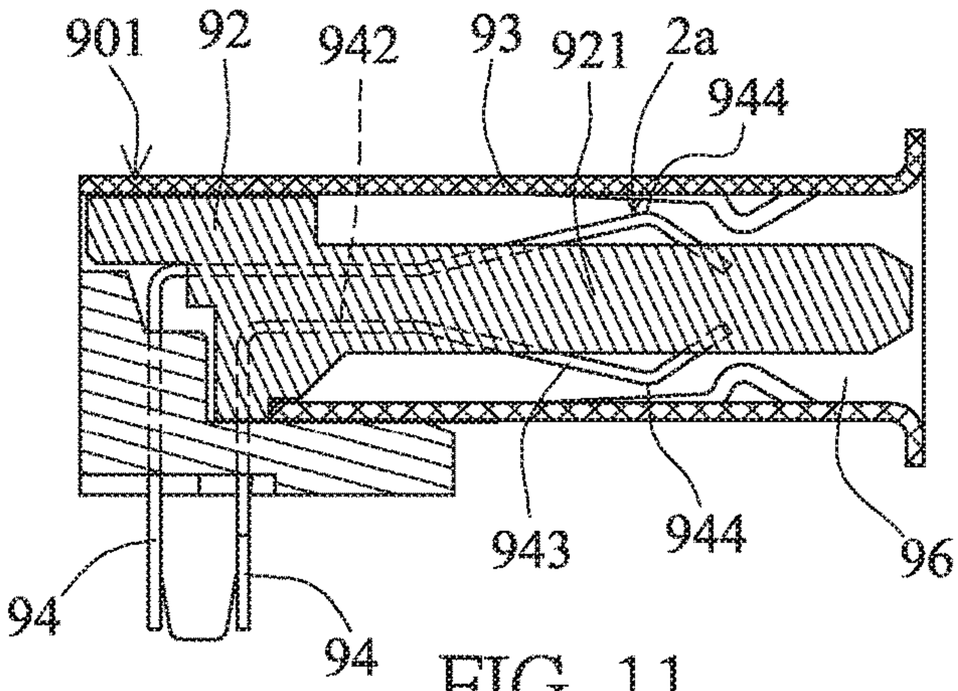

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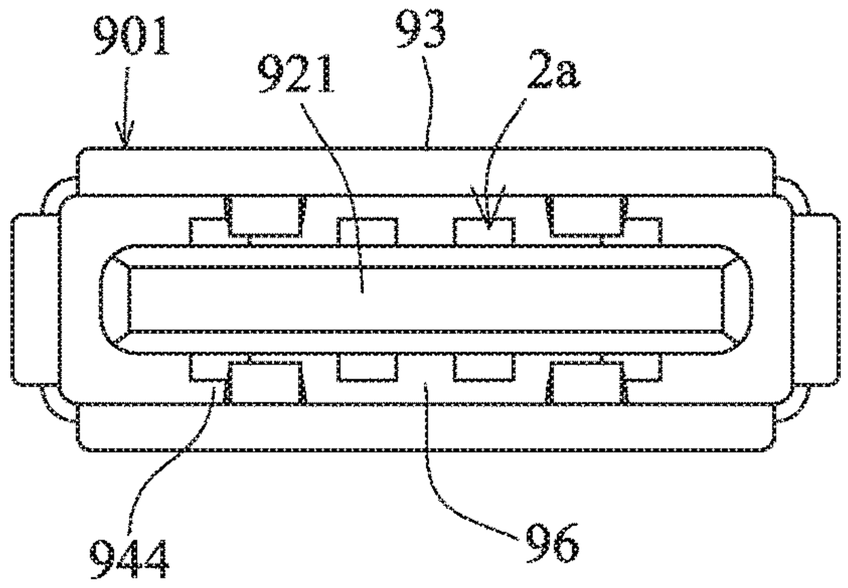

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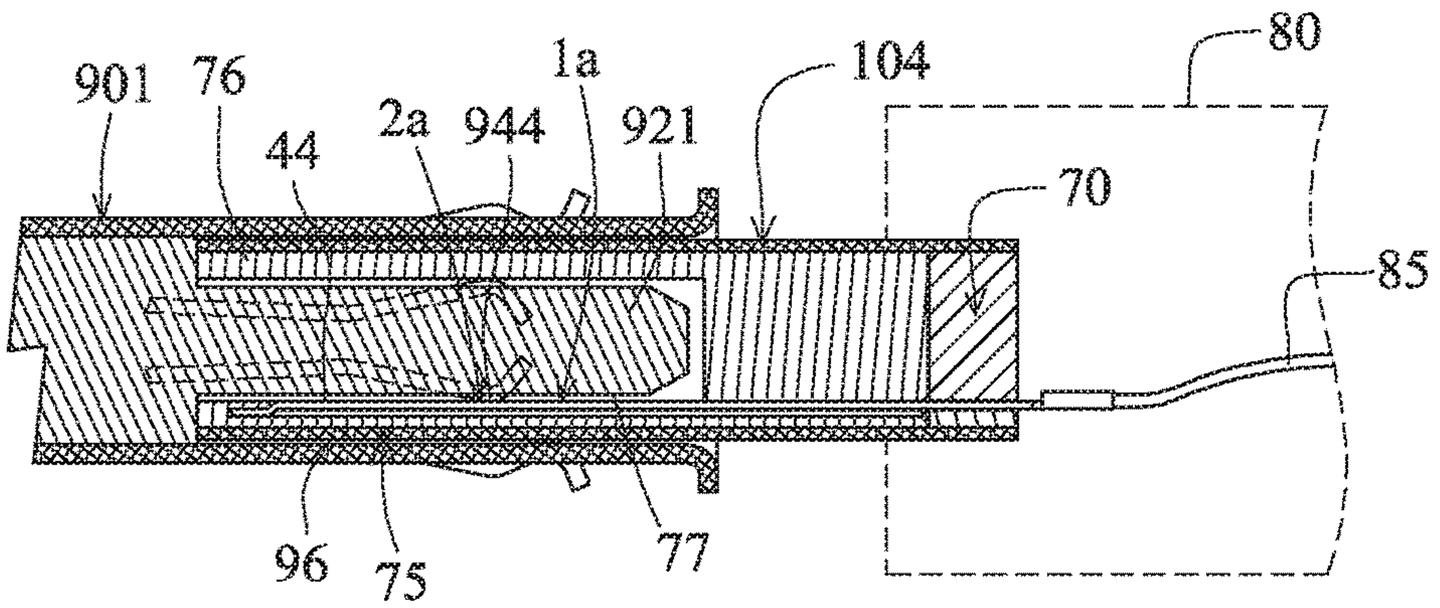

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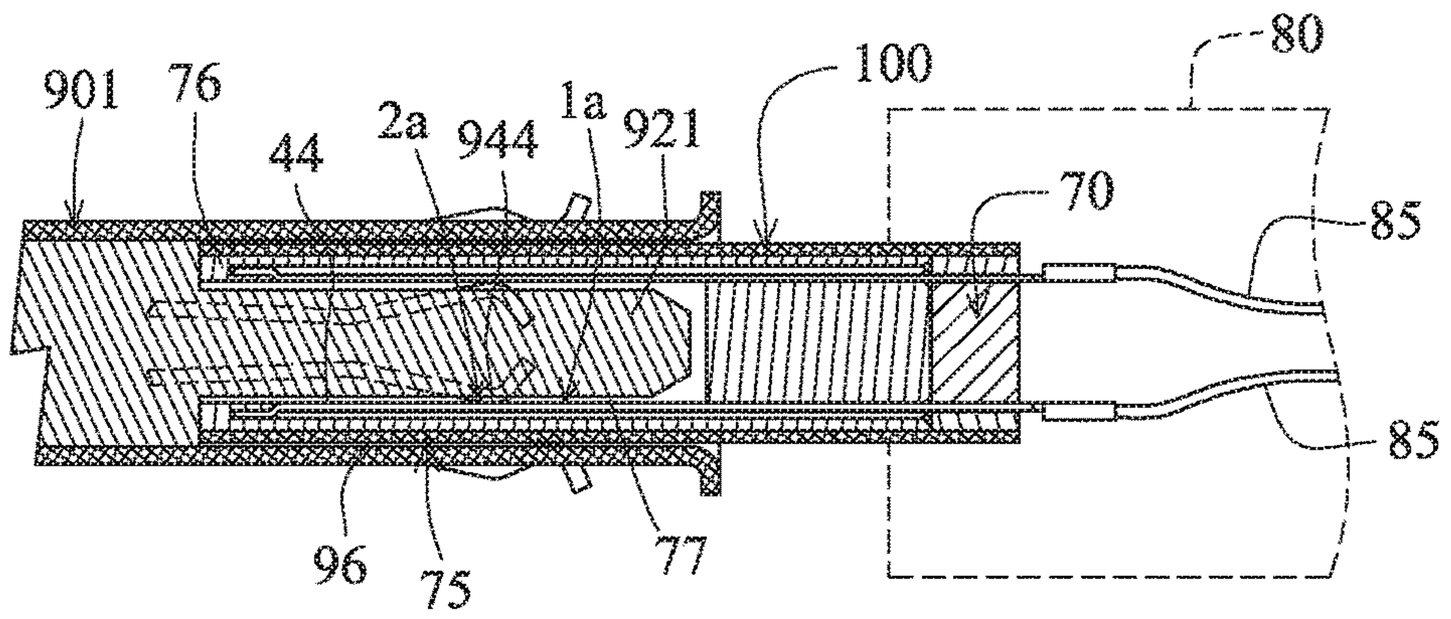

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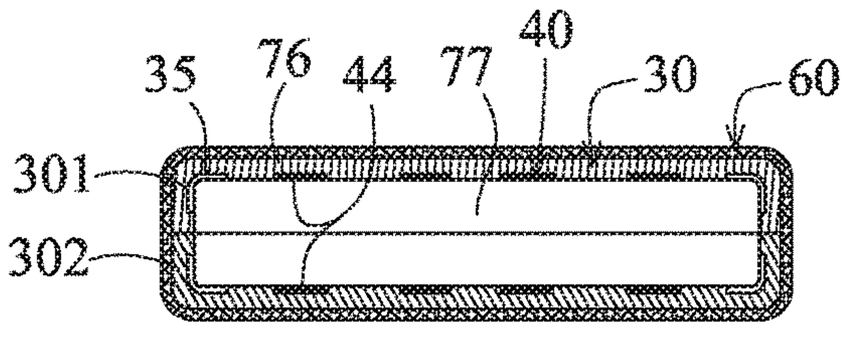

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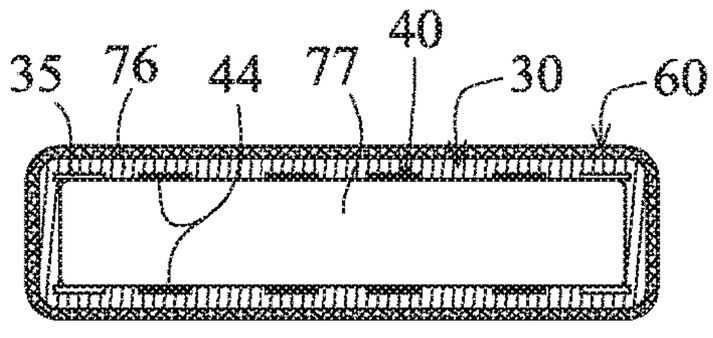

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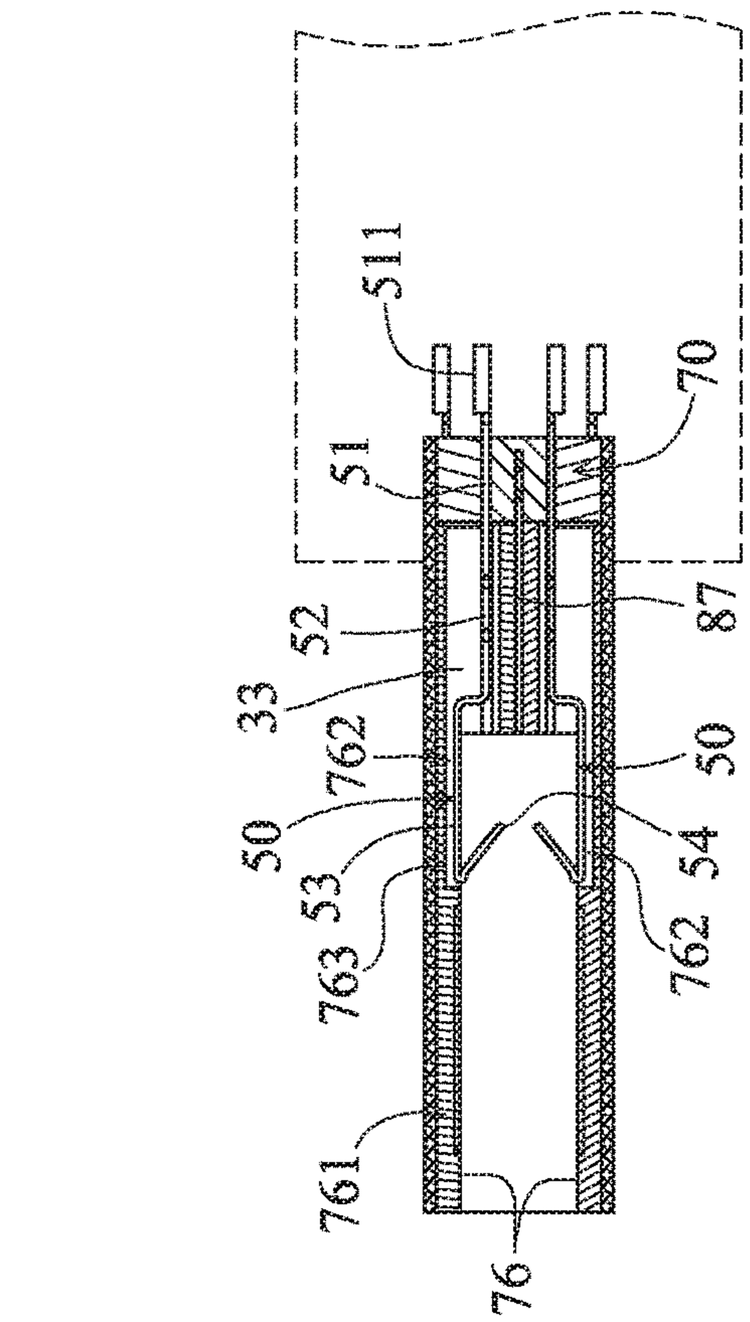

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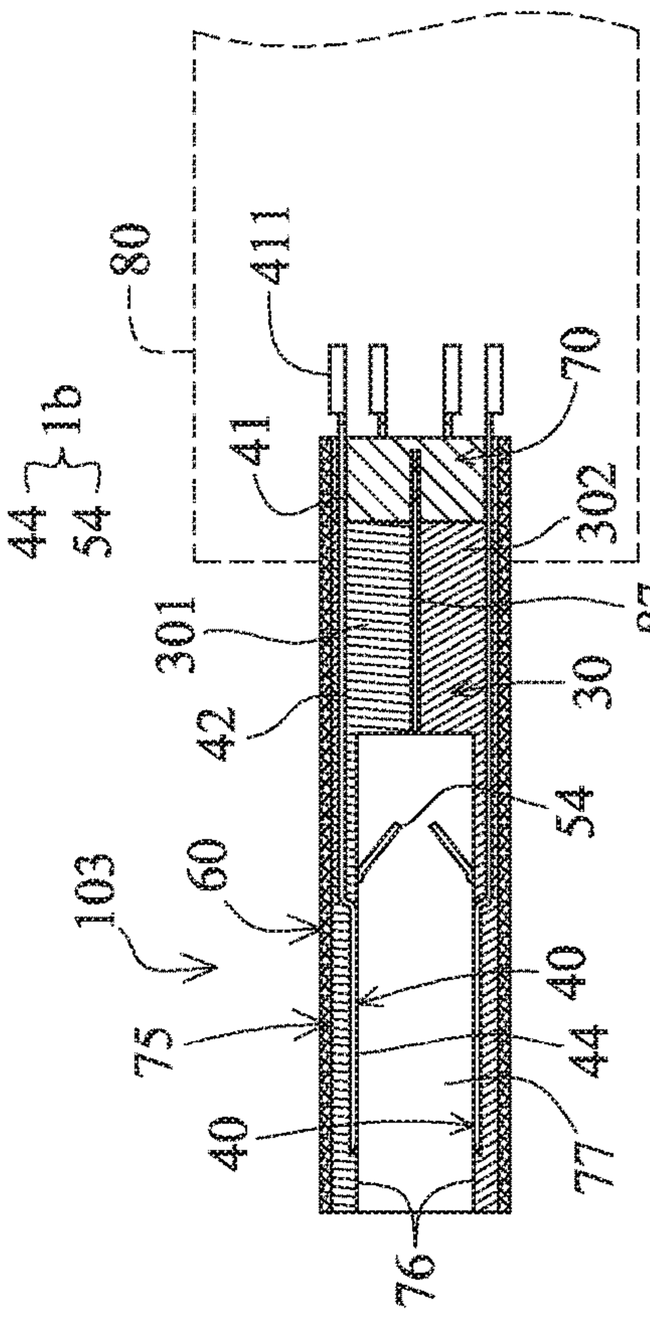

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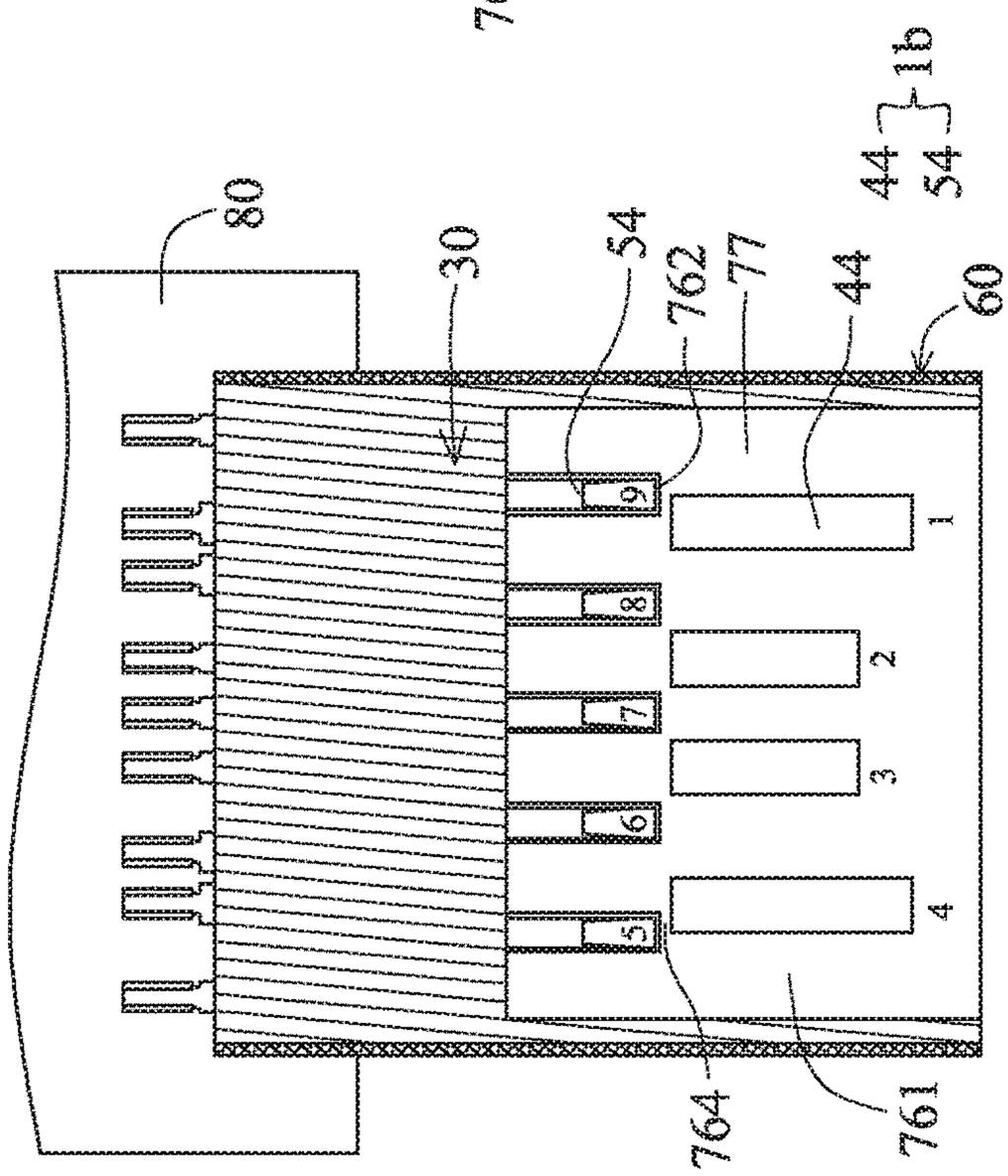

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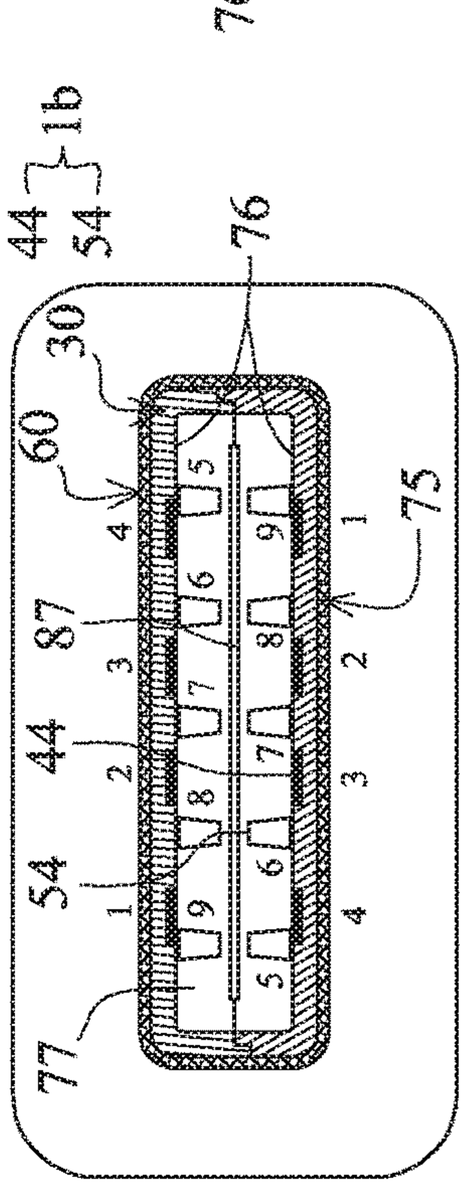

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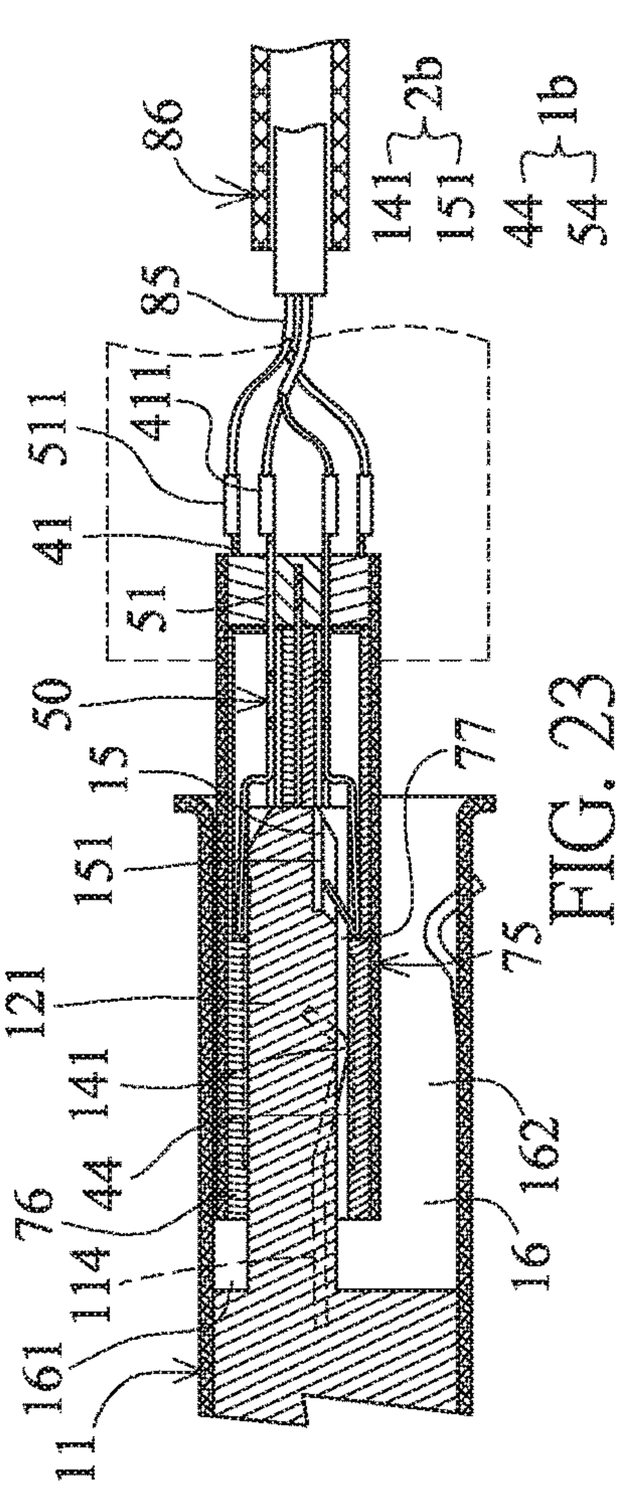

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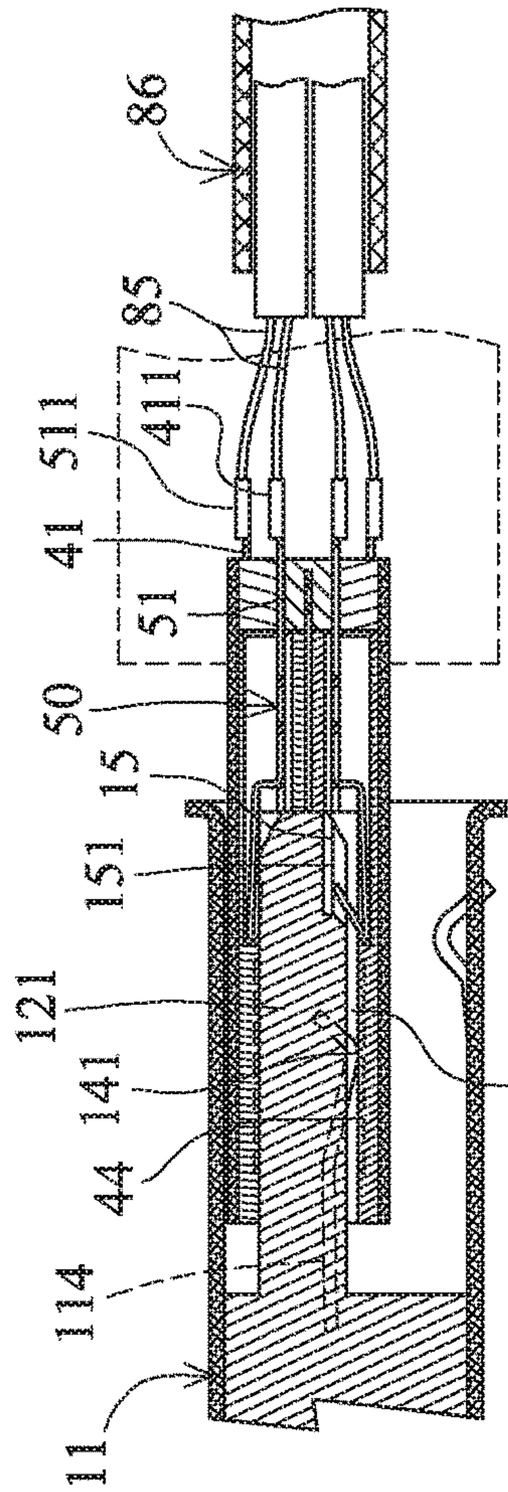

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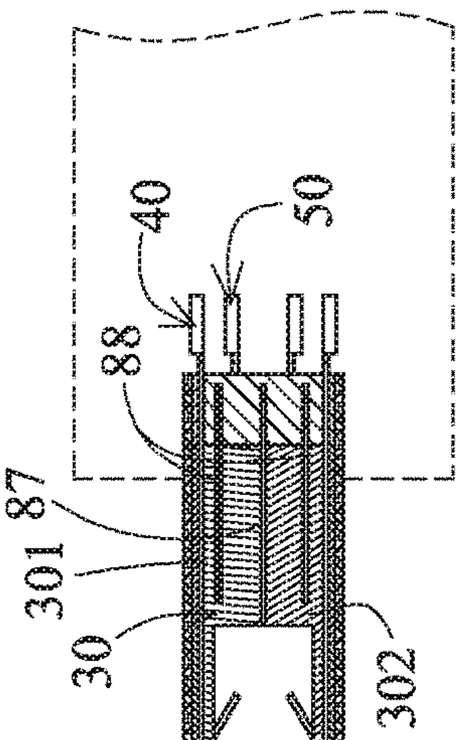


FIG. 25

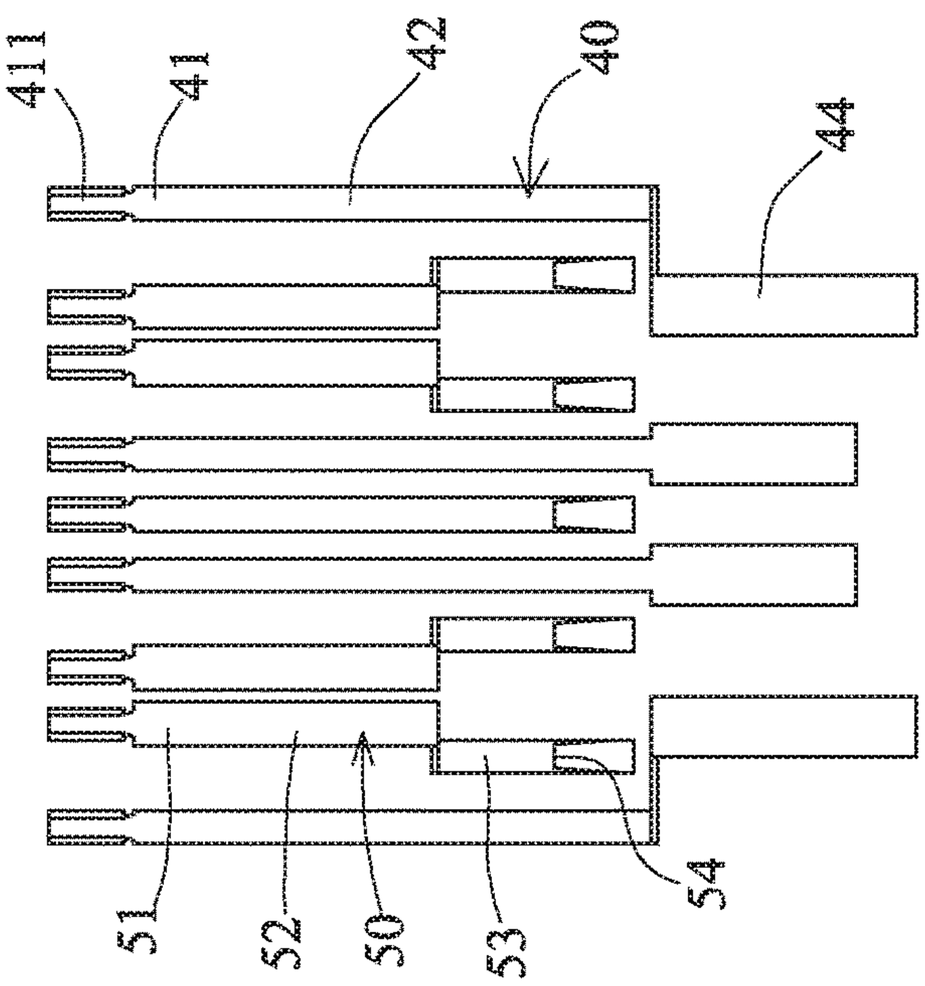
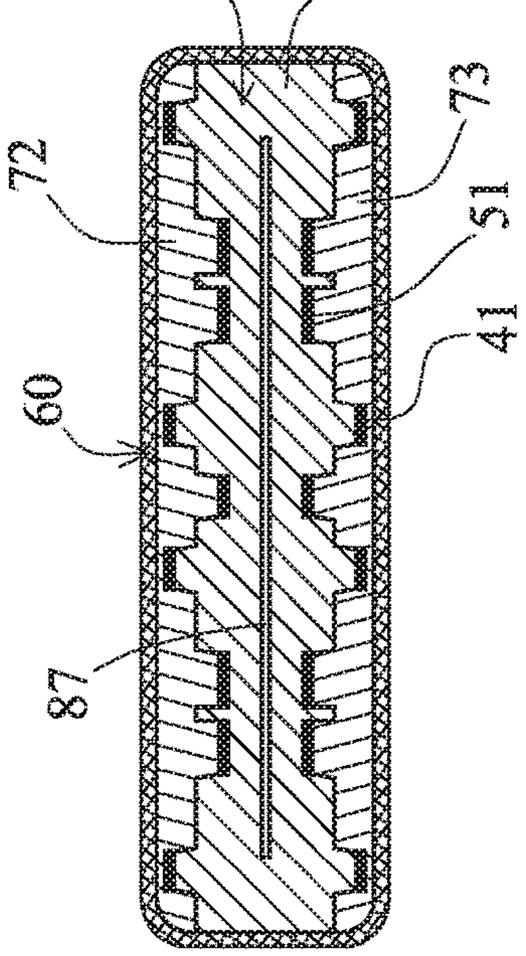


FIG. 21



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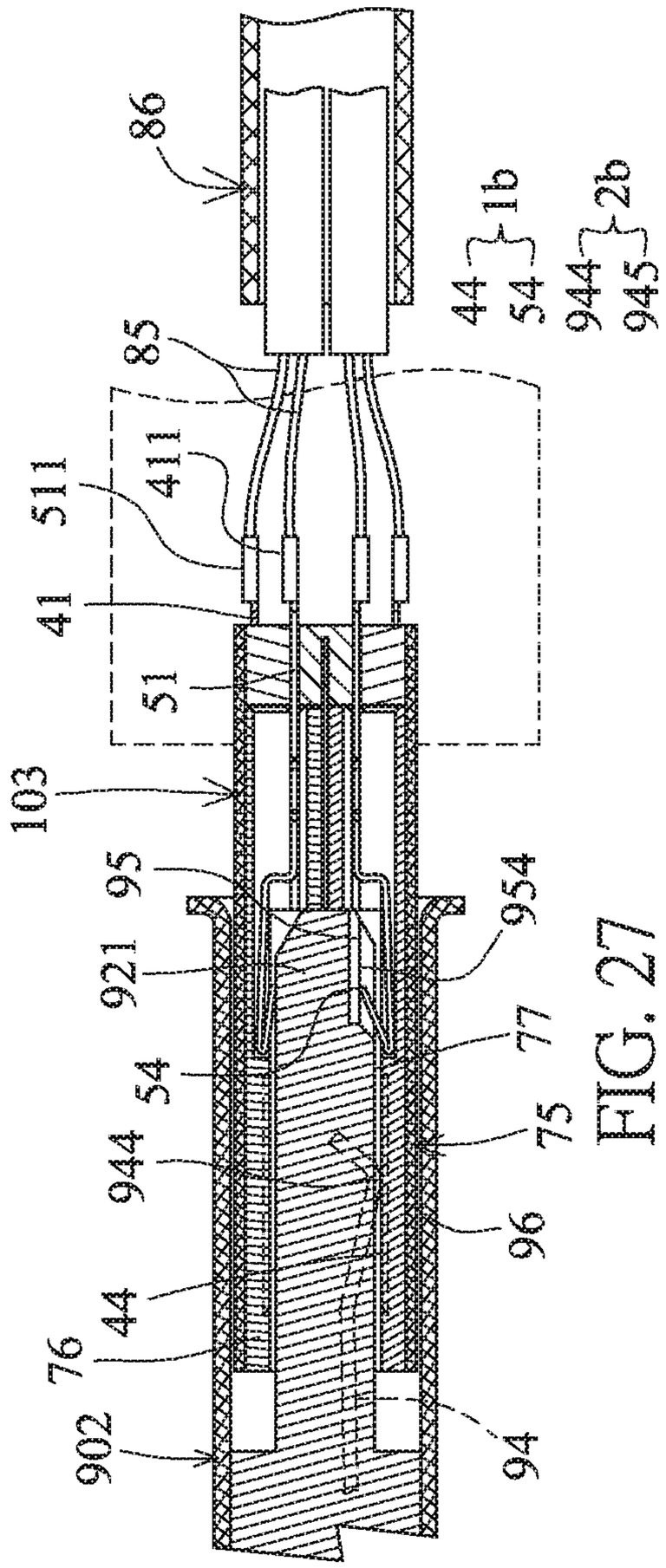

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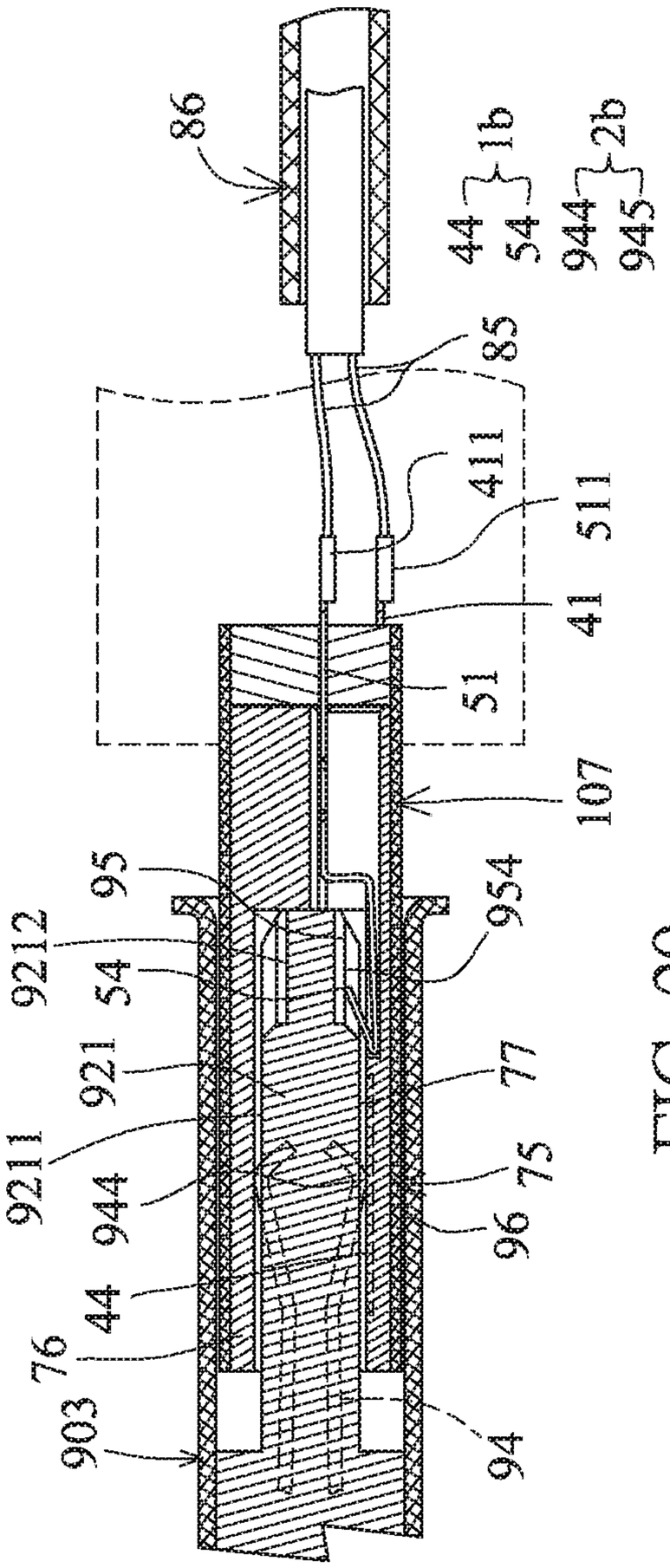

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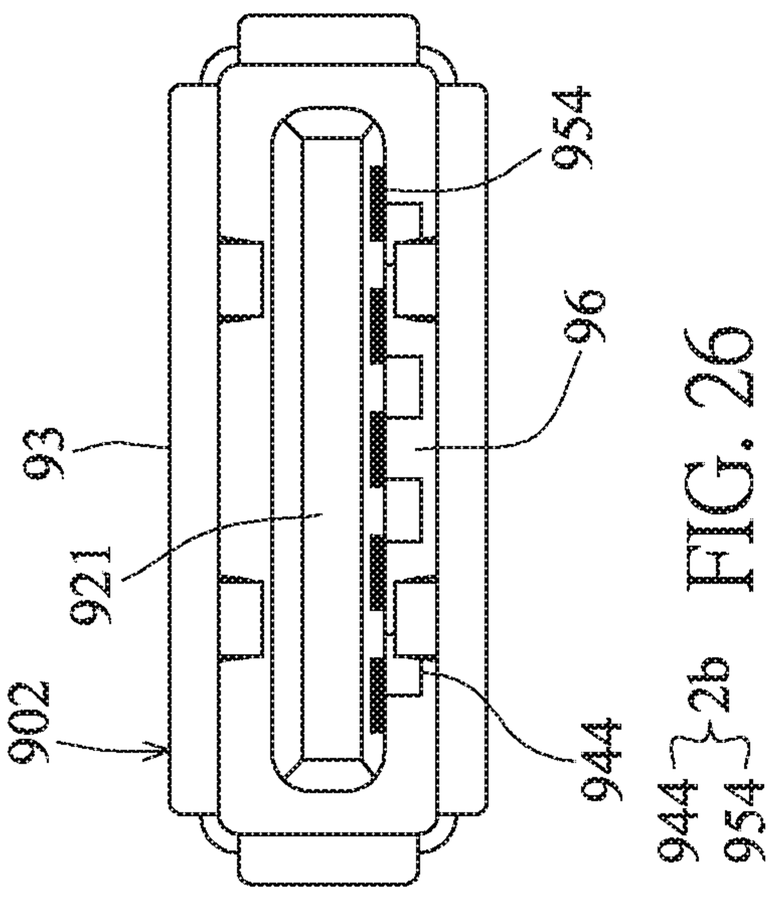

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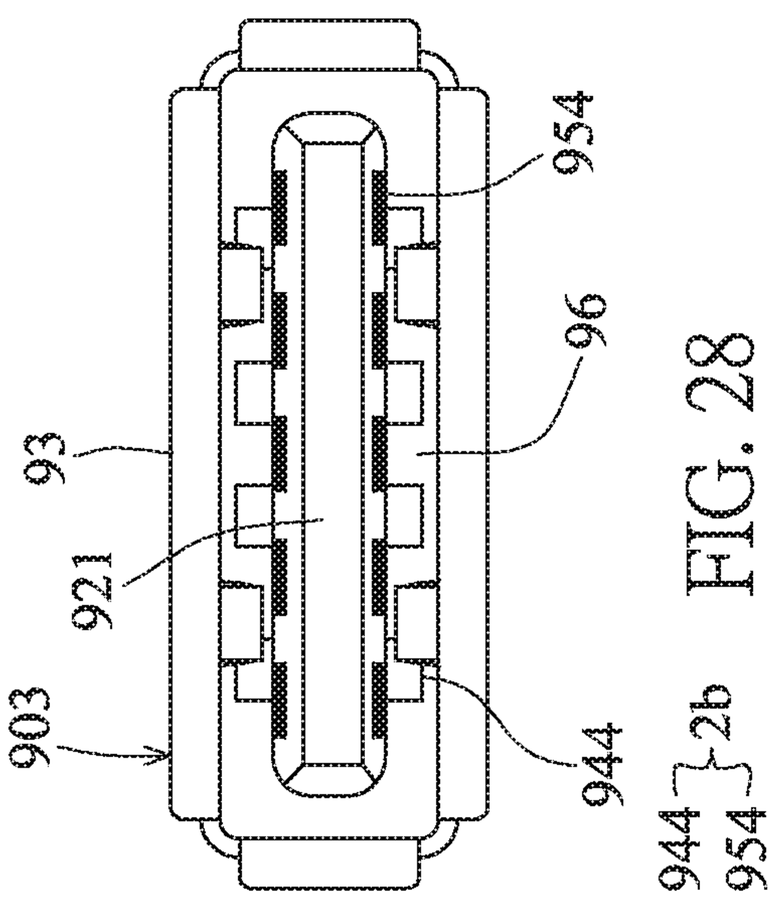

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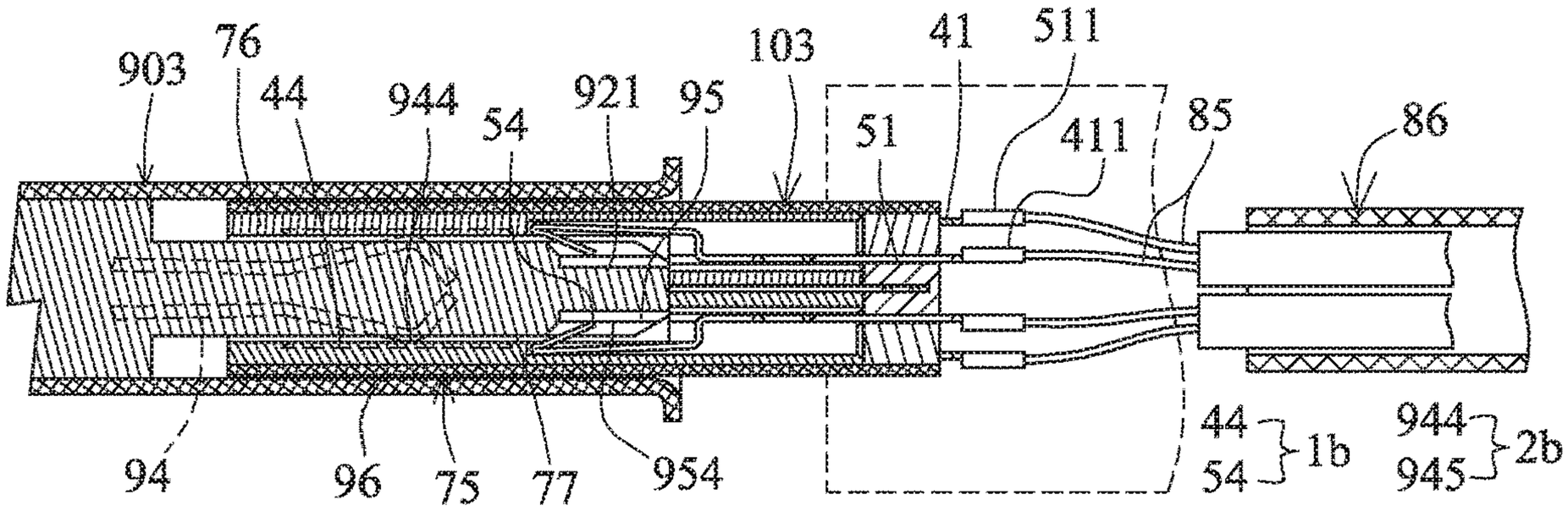

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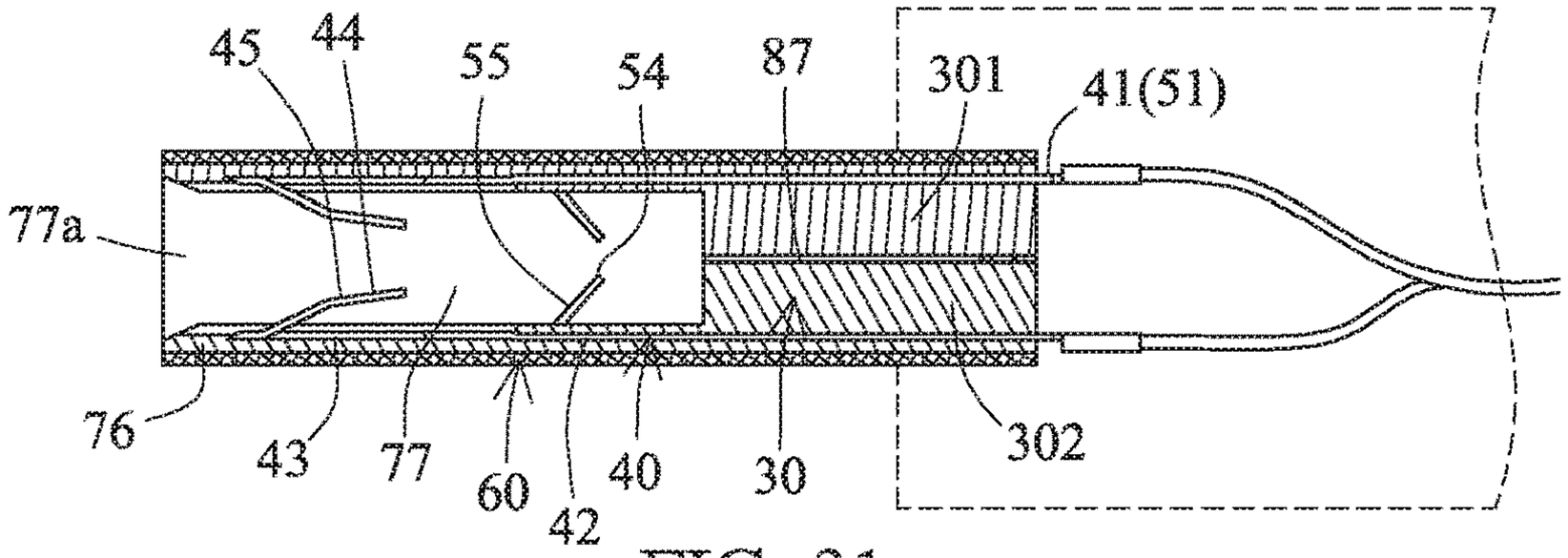
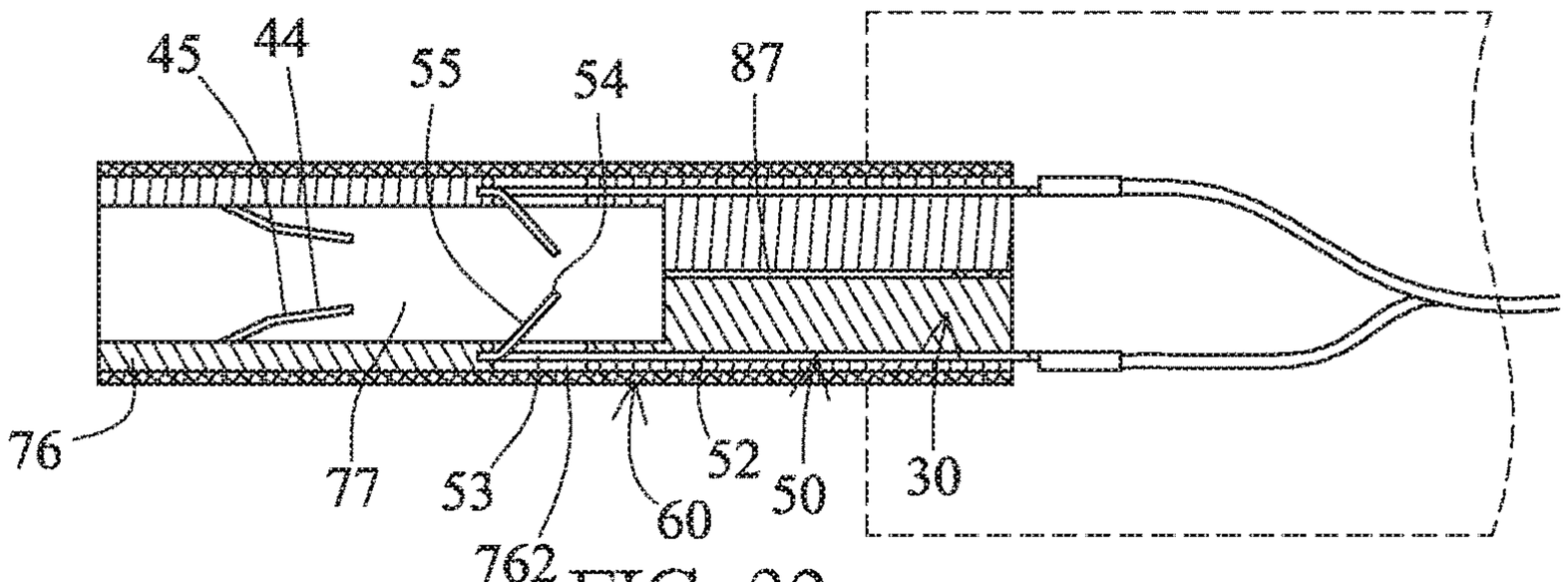


FIG. 31



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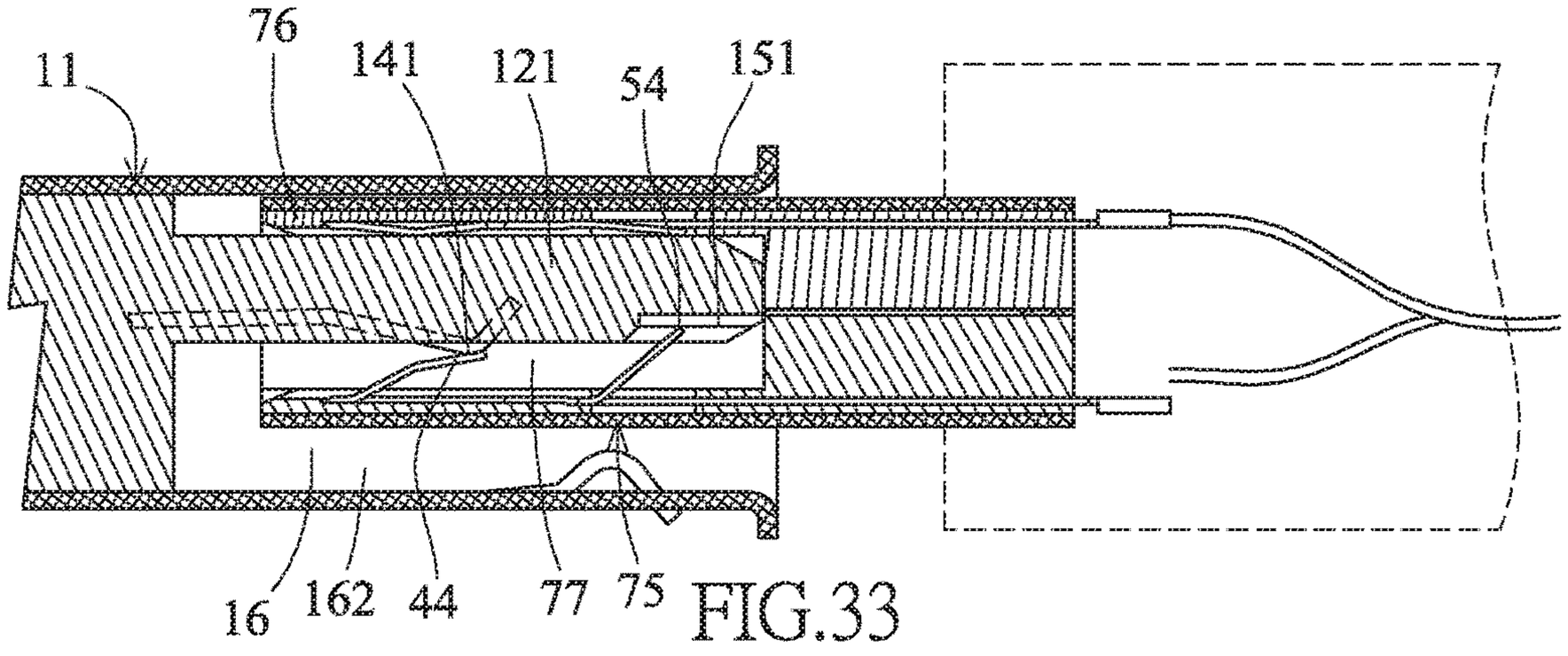

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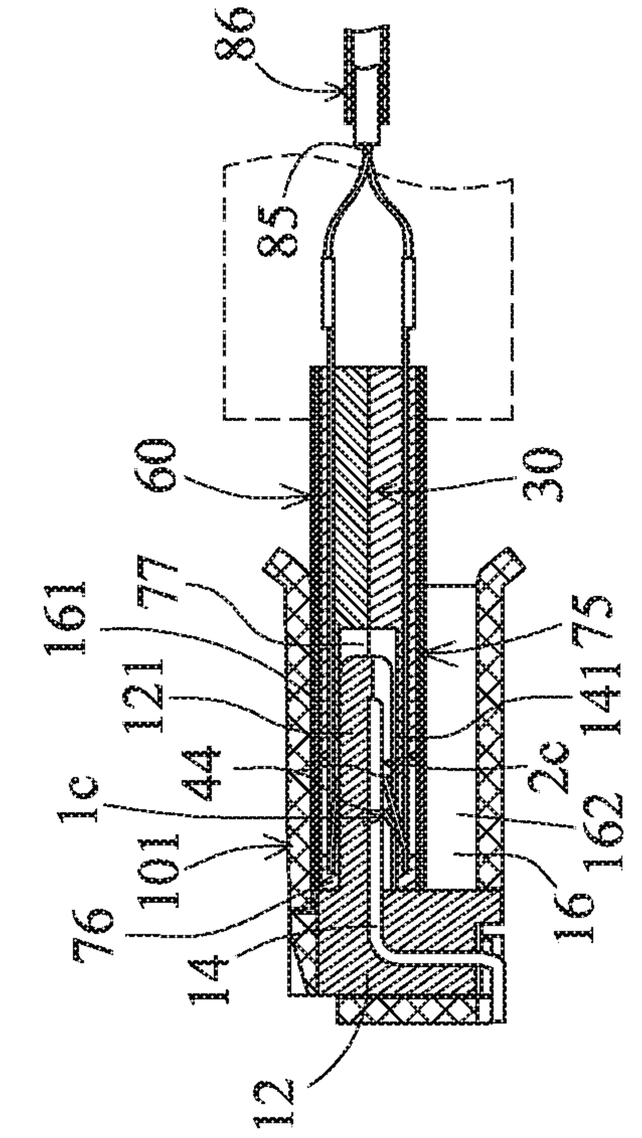

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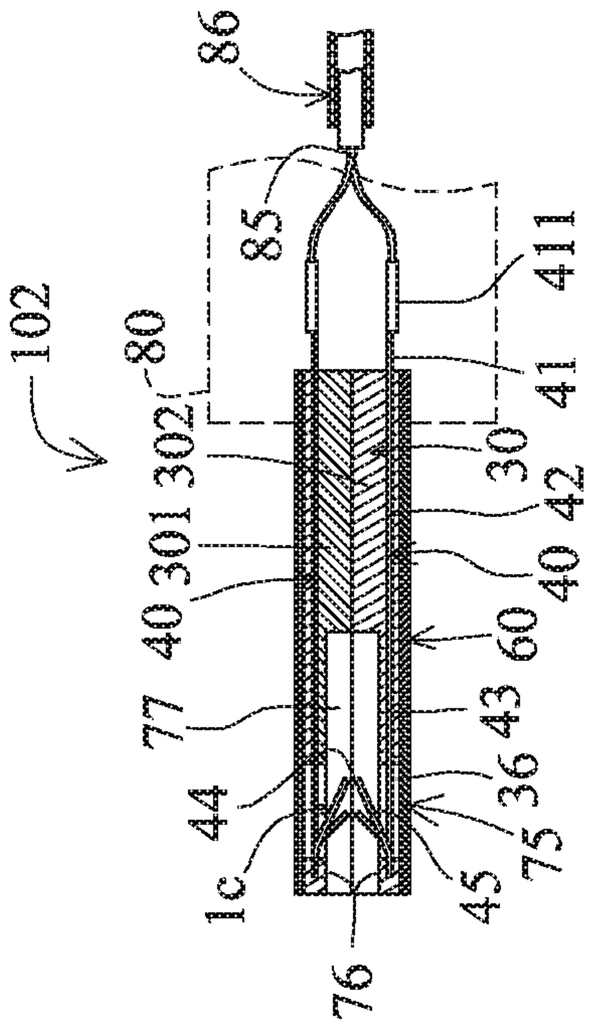

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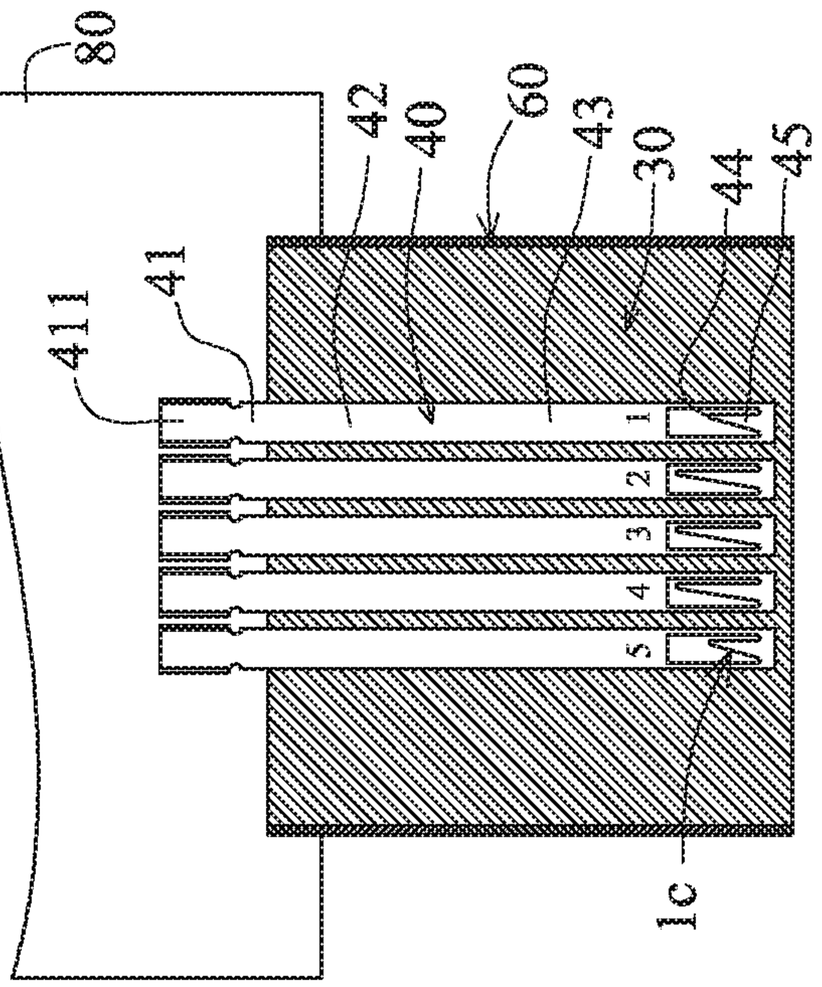

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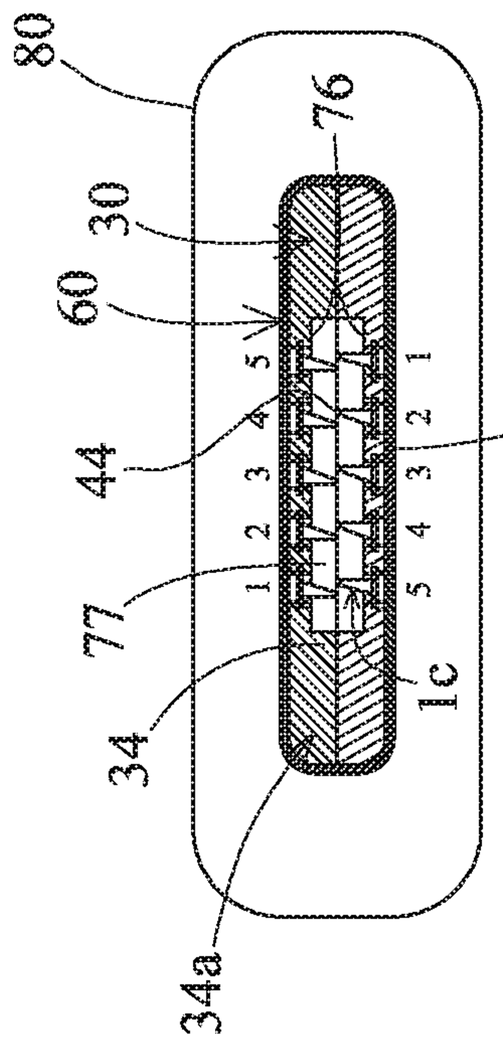

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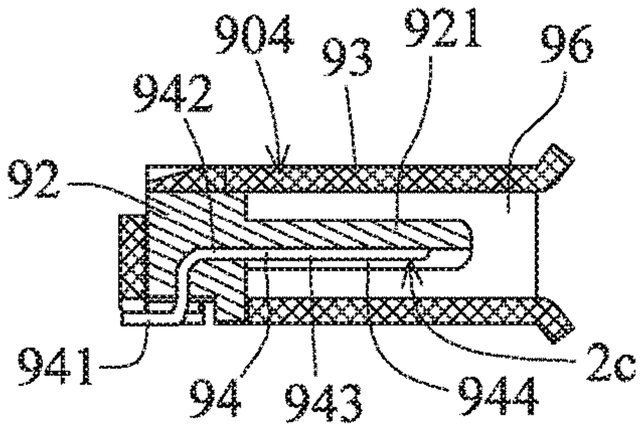

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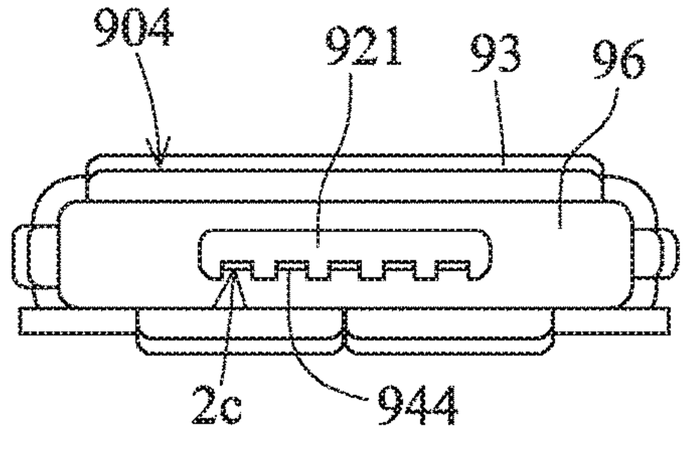

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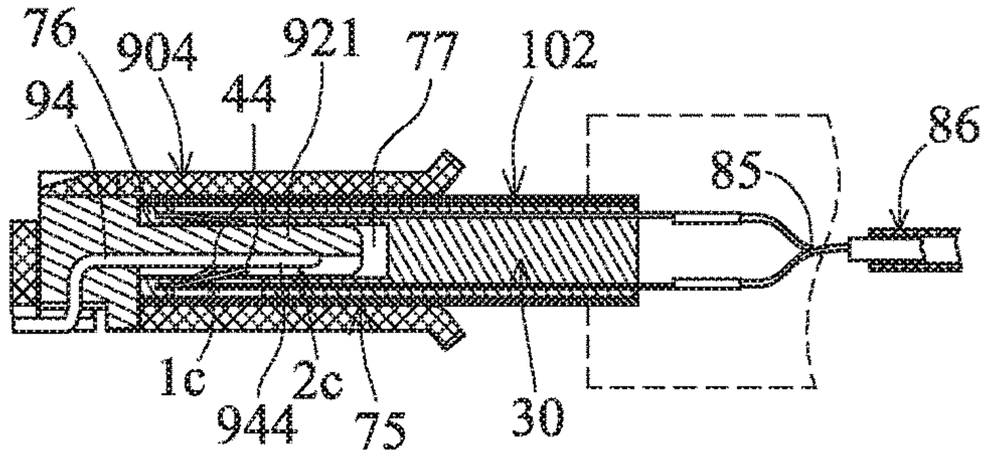

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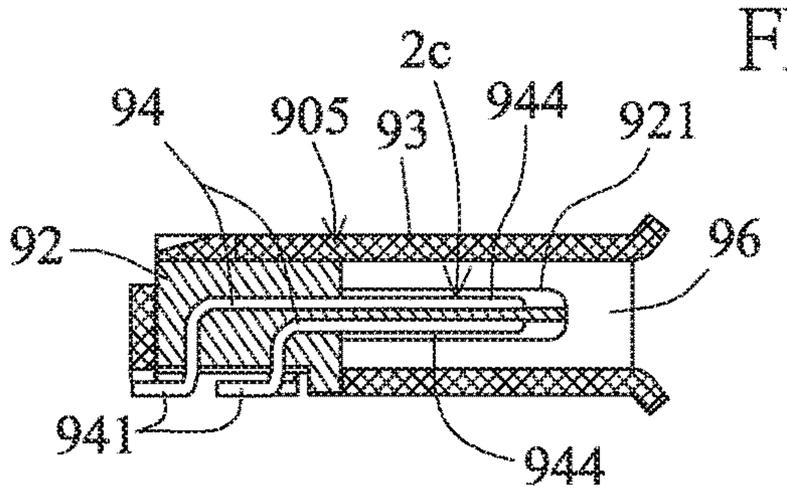

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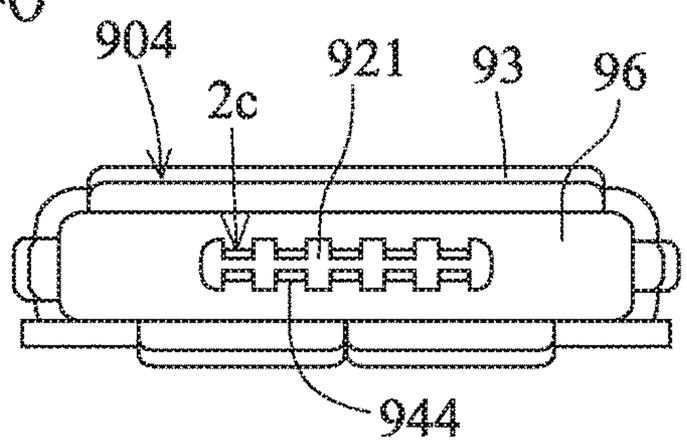

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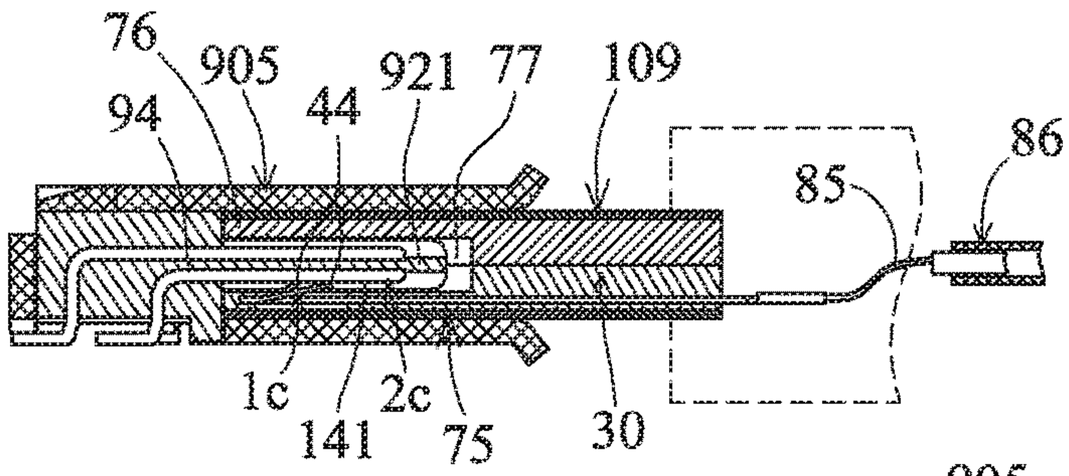

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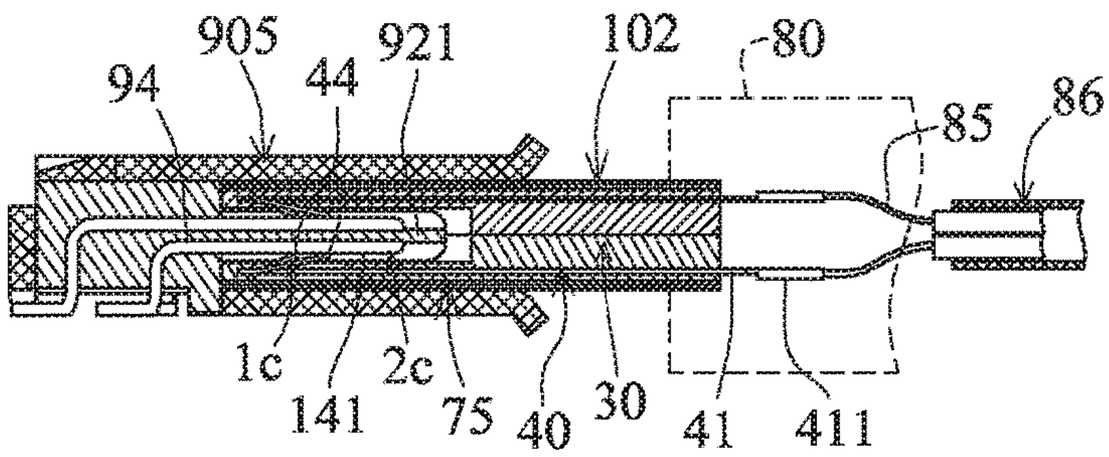

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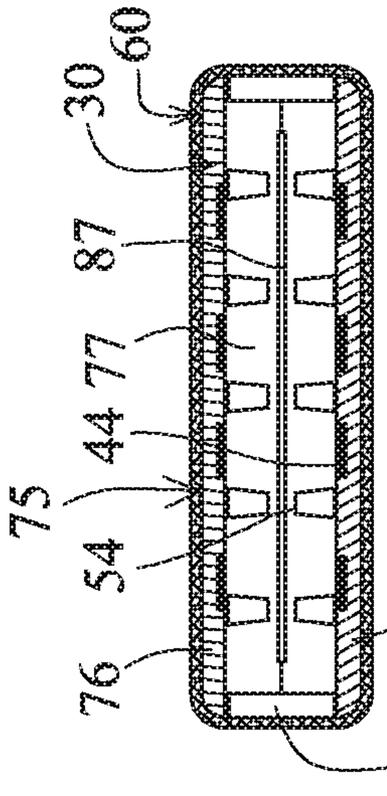
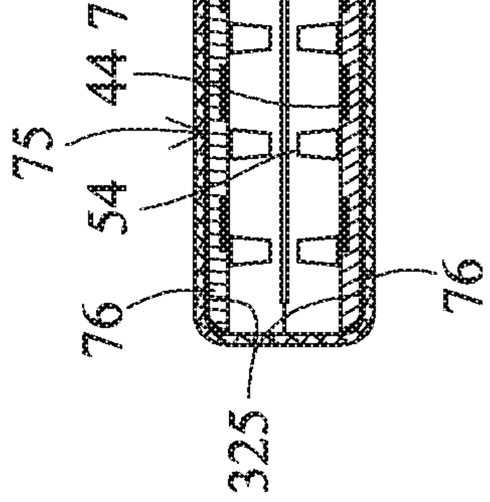


FIG. 45



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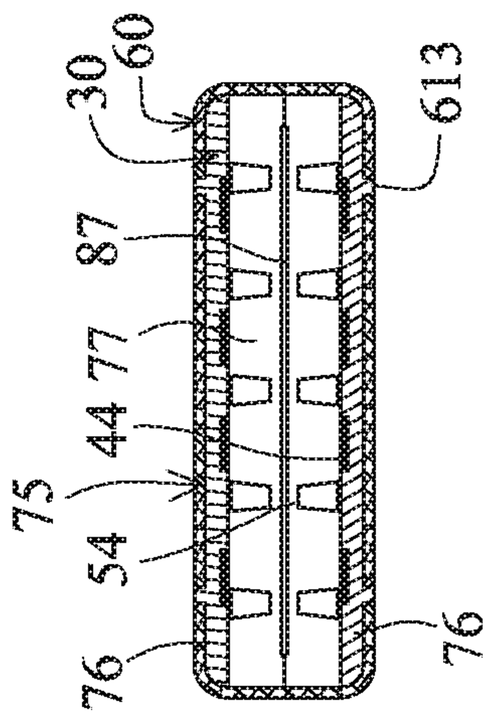

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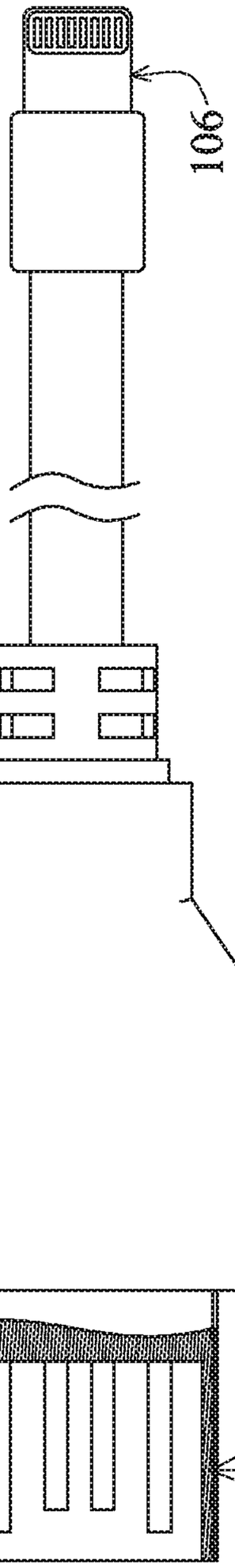


FIG. 48

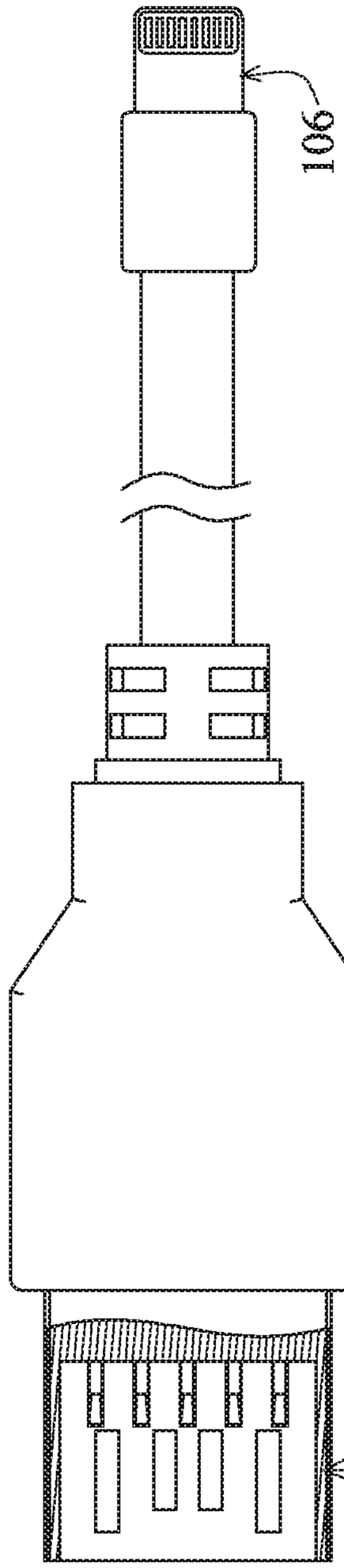


FIG. 49

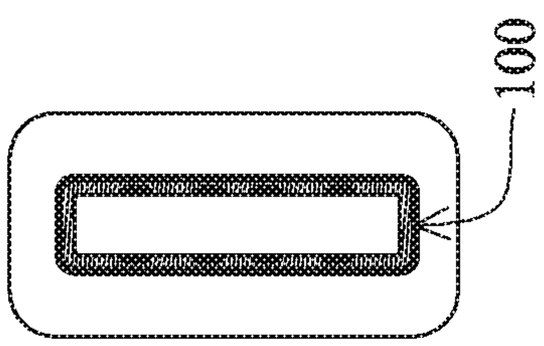


FIG. 48A

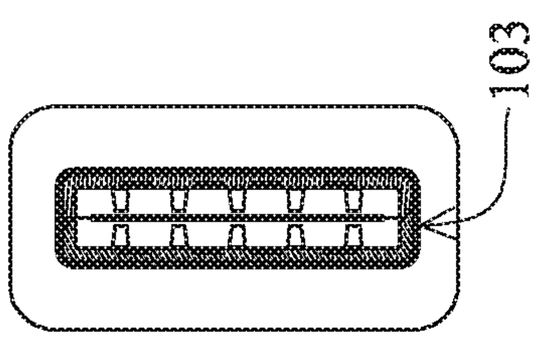


FIG. 49A

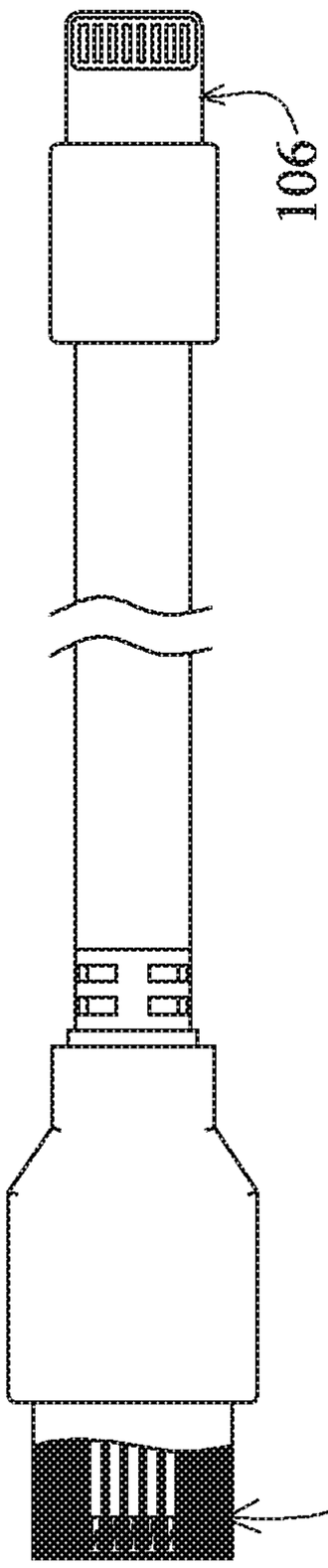


FIG. 50

FIG. 50A

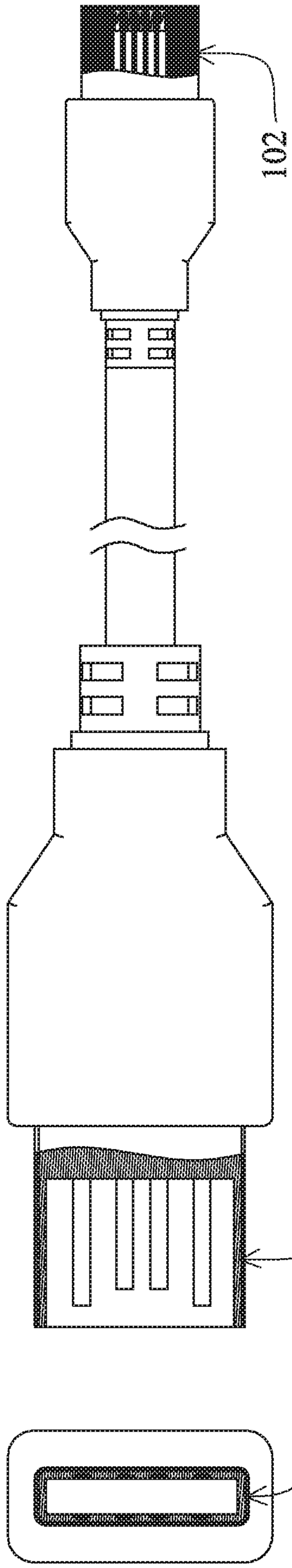


FIG. 51

FIG. 51A

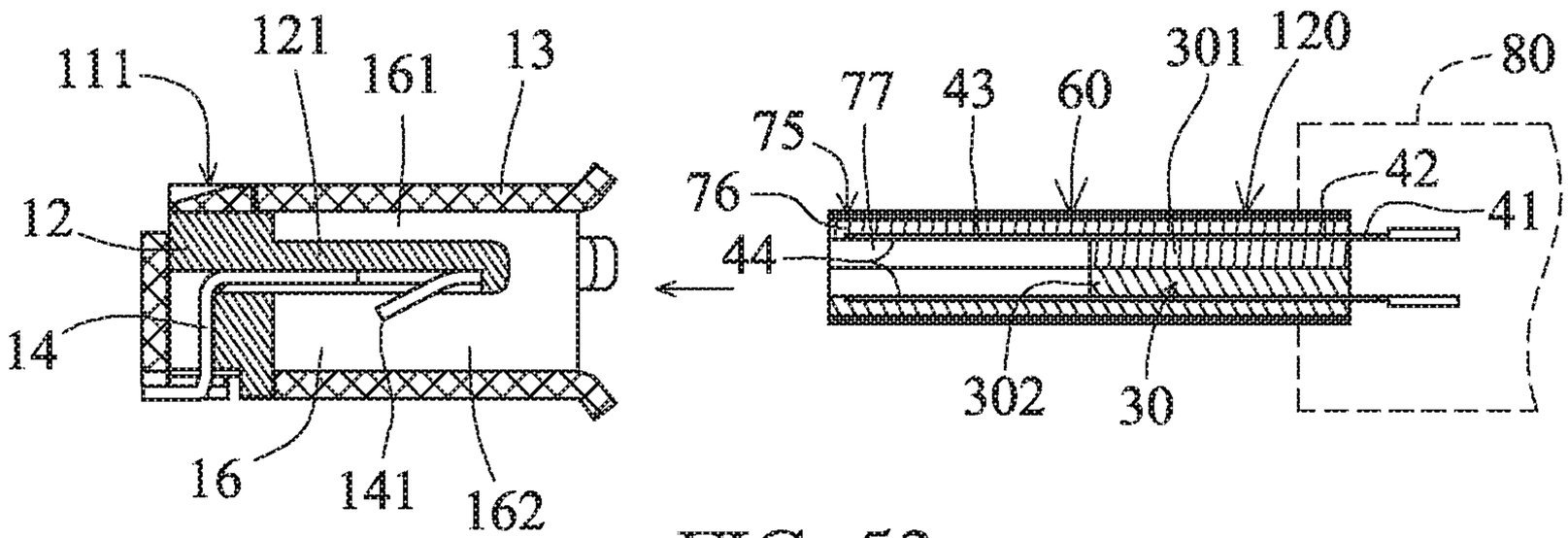


FIG. 52

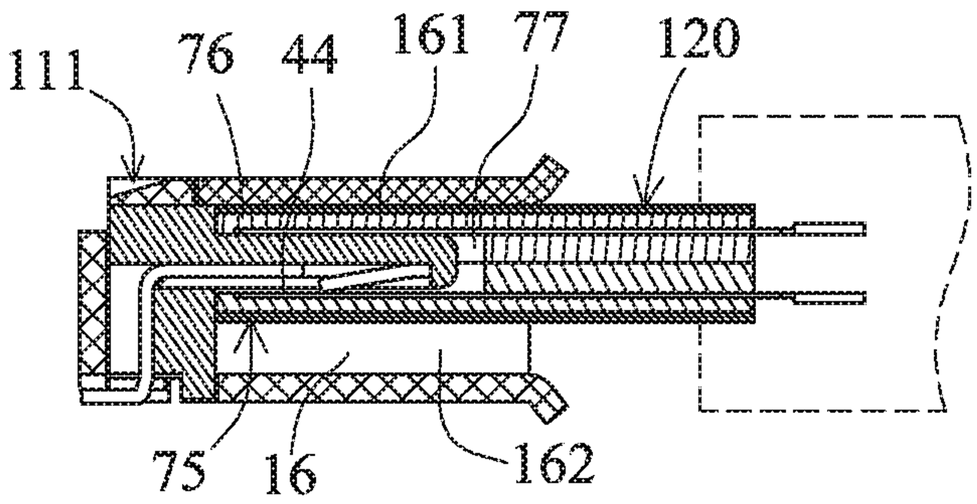


FIG. 53

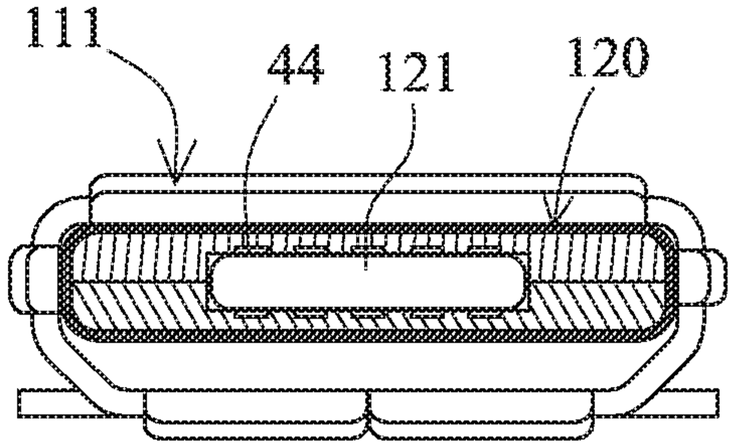


FIG. 54

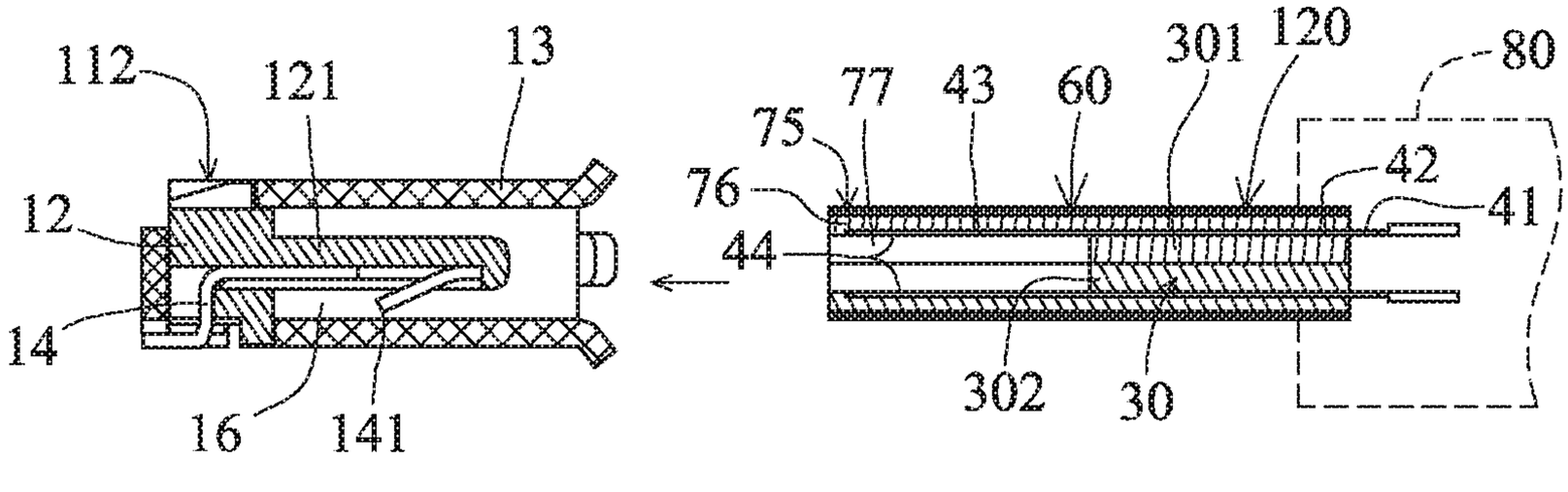


FIG. 55

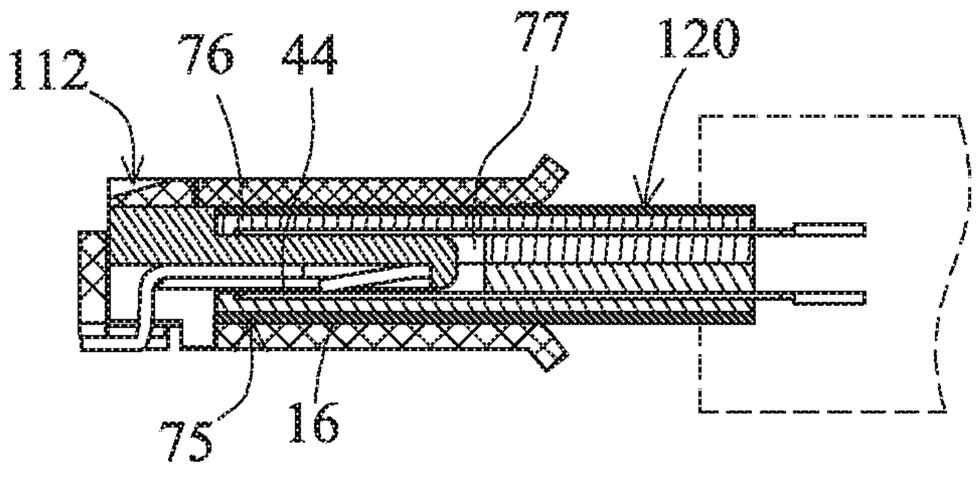


FIG. 56

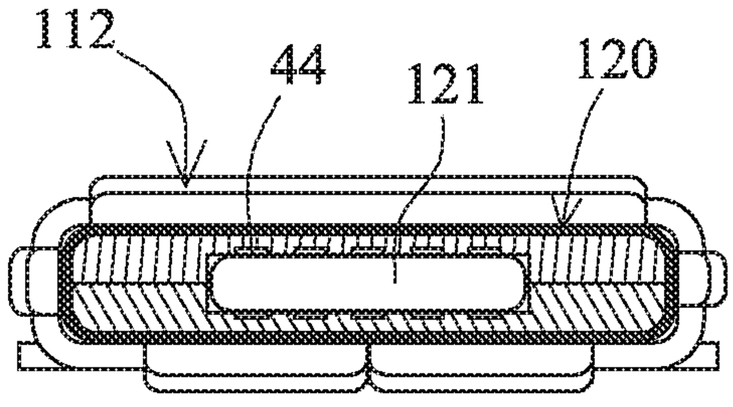


FIG. 57

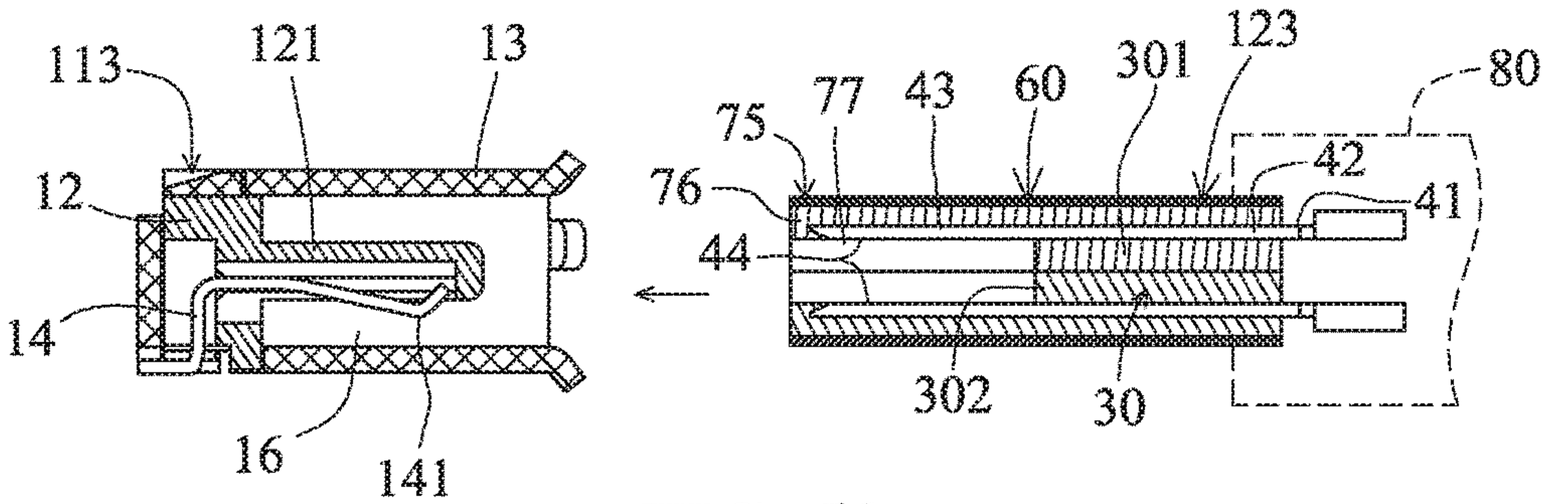


FIG. 58

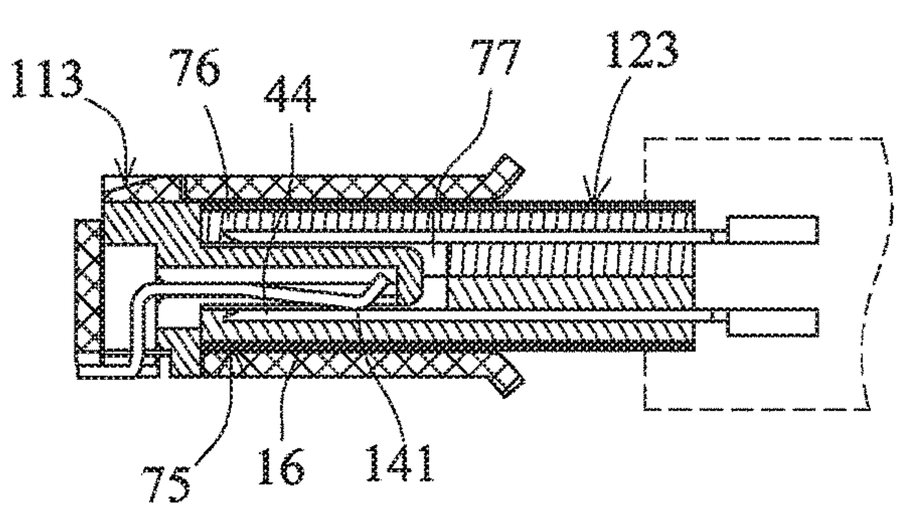


FIG. 59

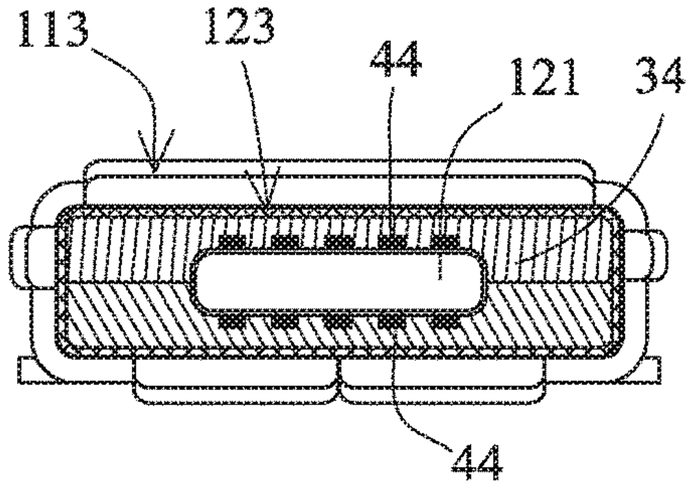
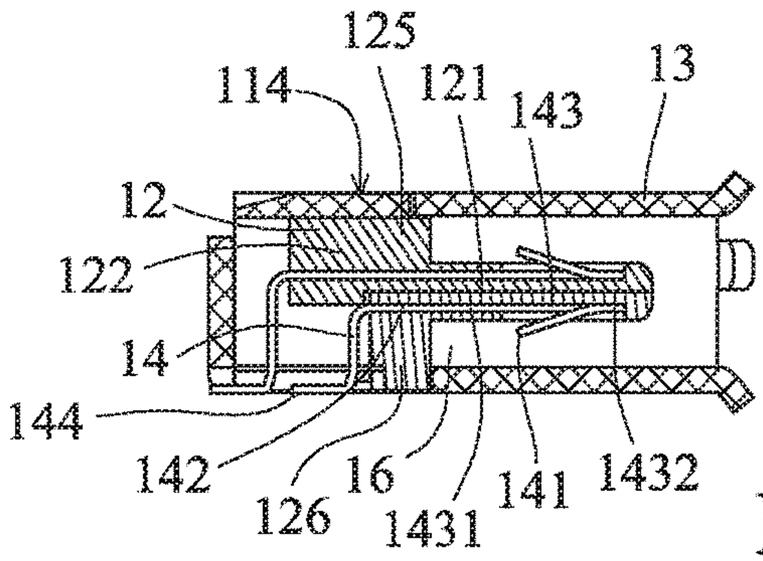


FIG. 60



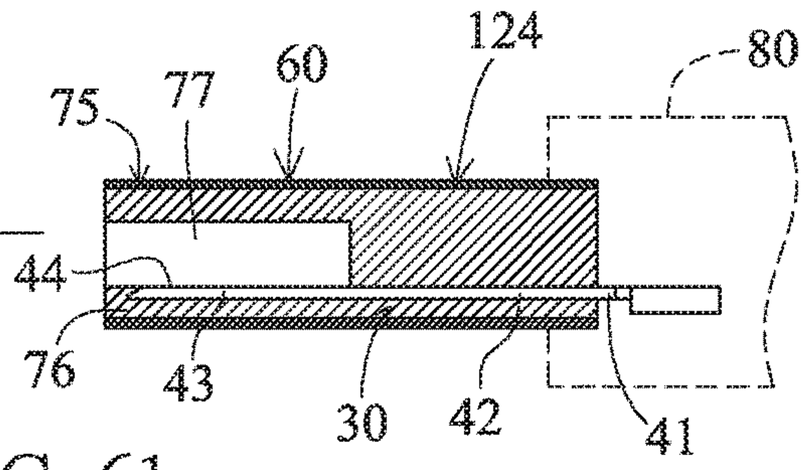


FIG. 61

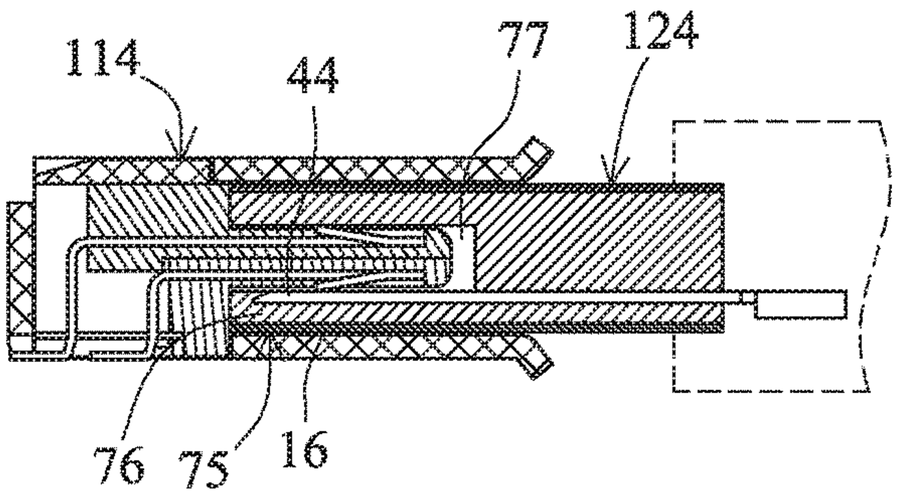


FIG. 62

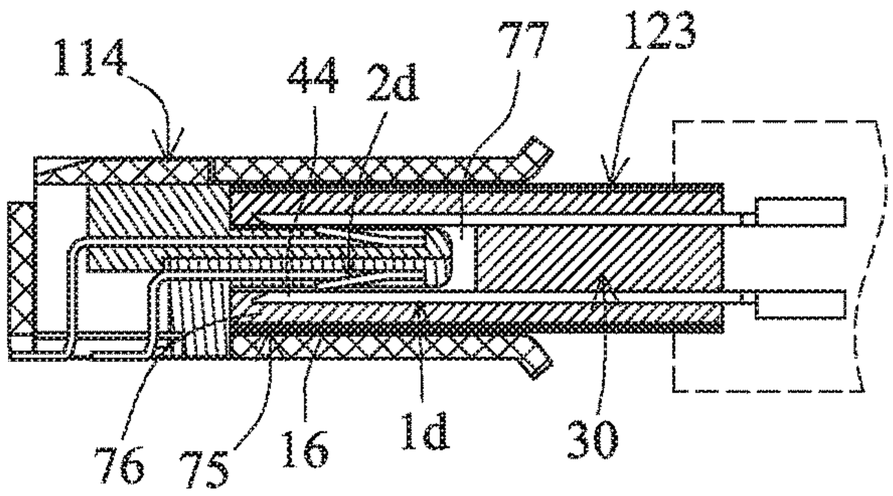


FIG. 63

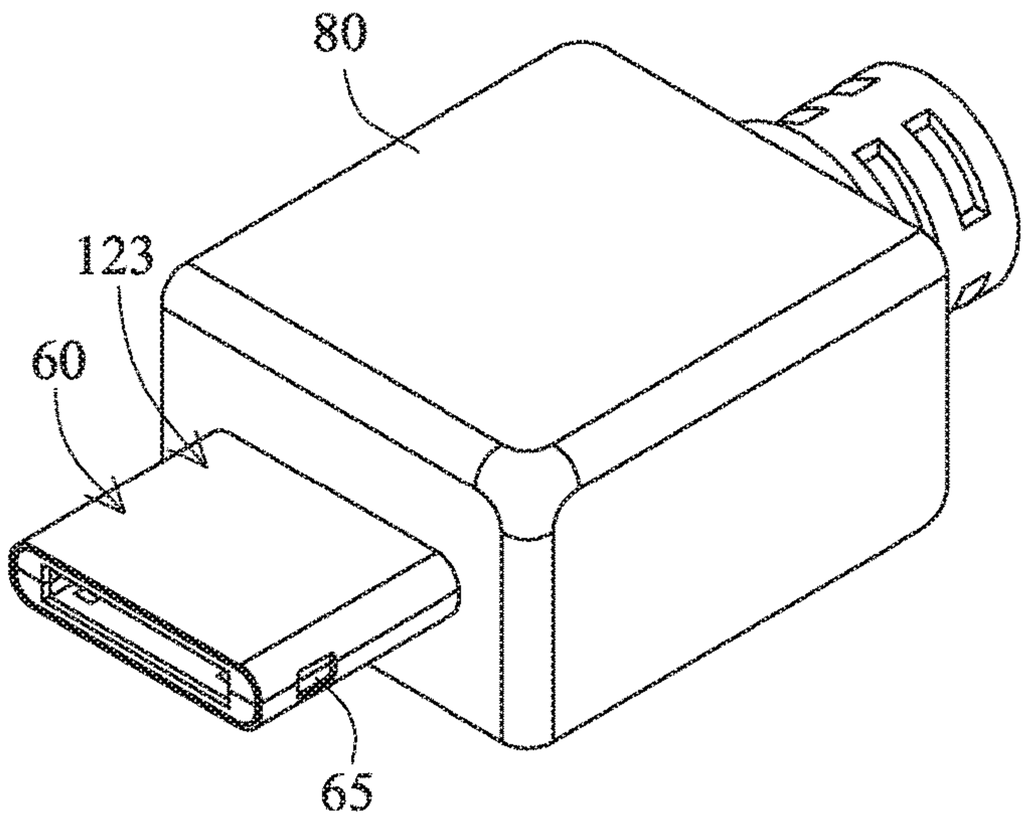


FIG. 64

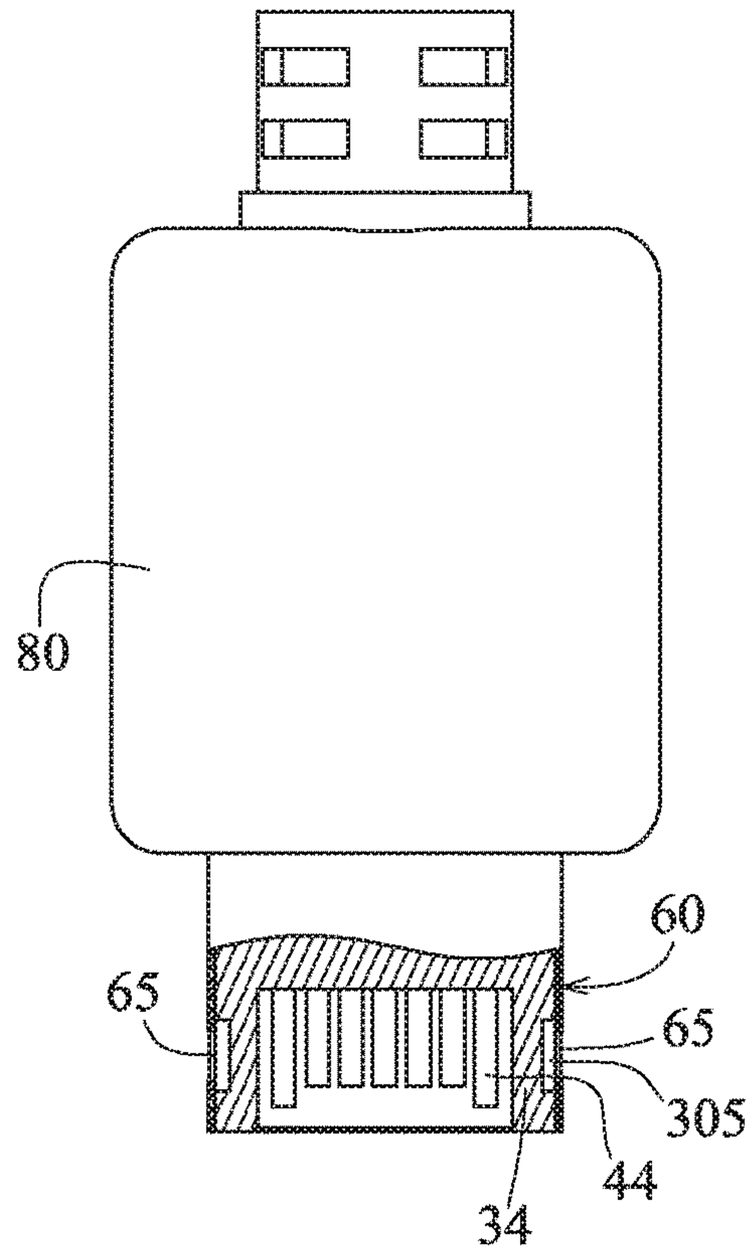


FIG. 65

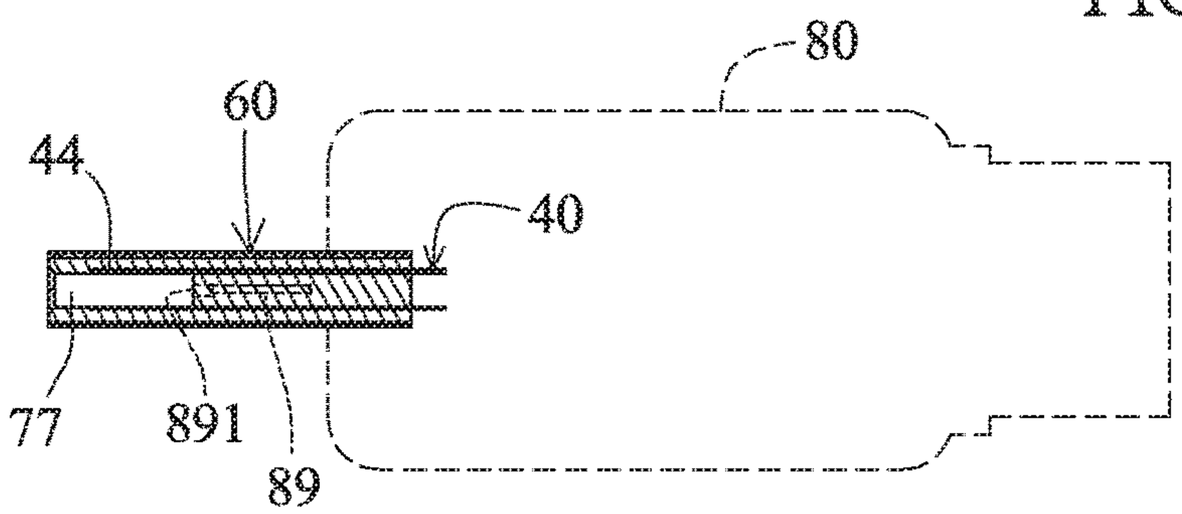


FIG. 66

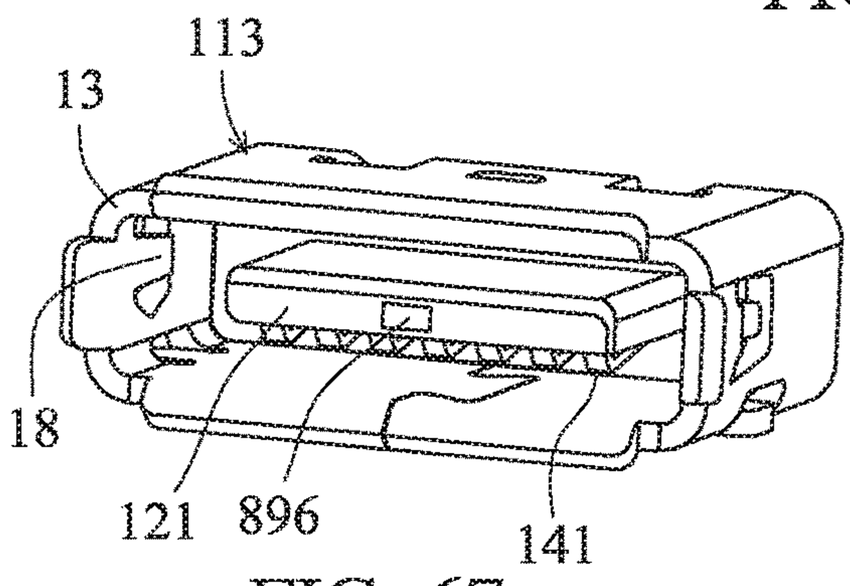


FIG. 67

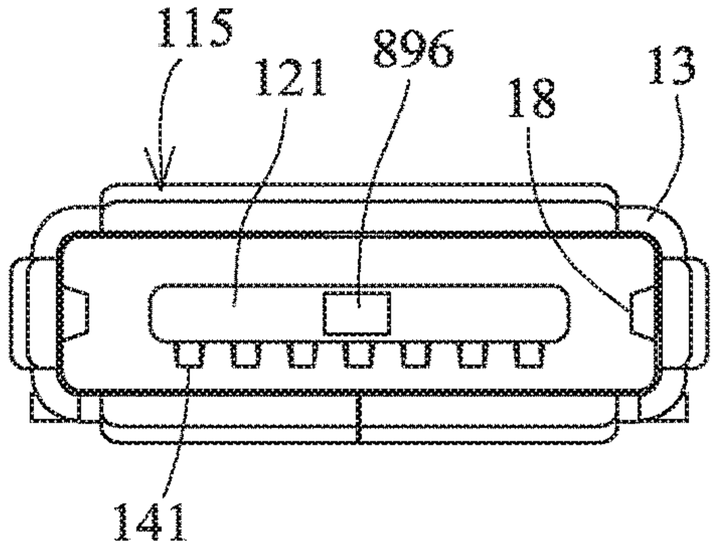


FIG. 68

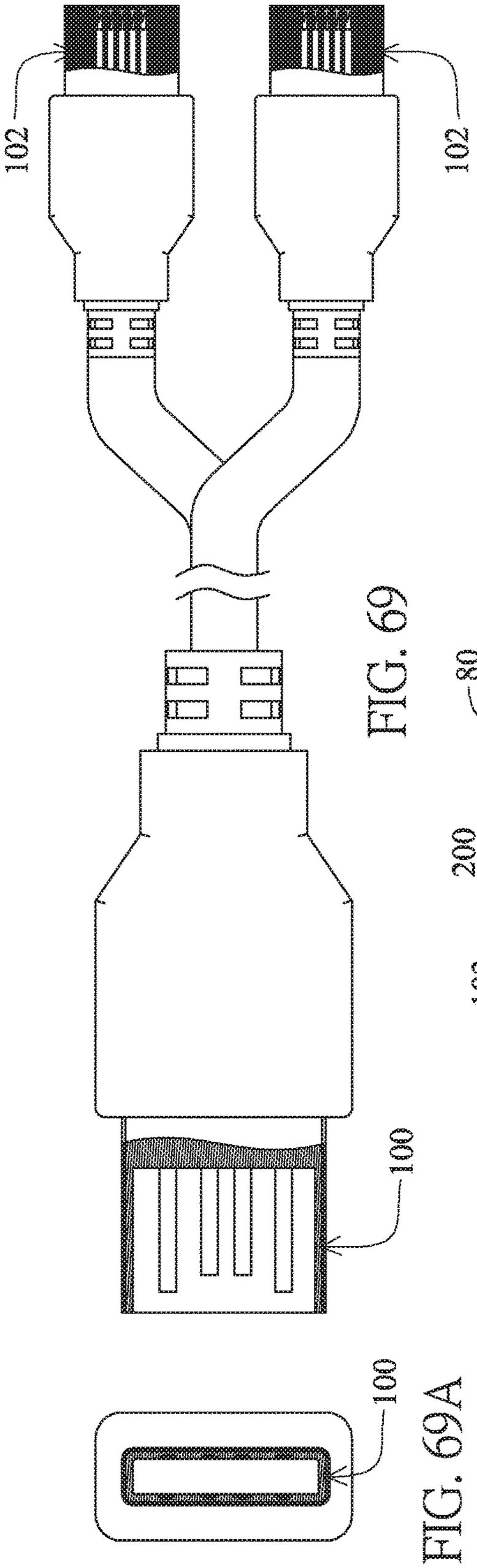


FIG. 69

FIG. 69A

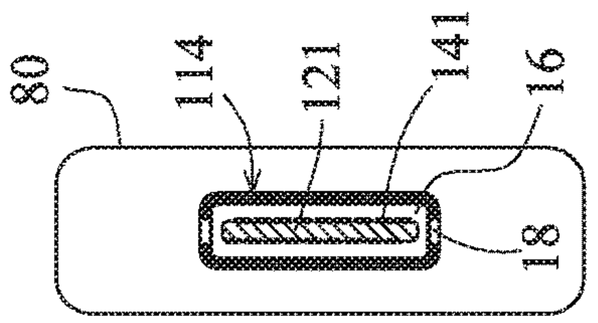


FIG. 72

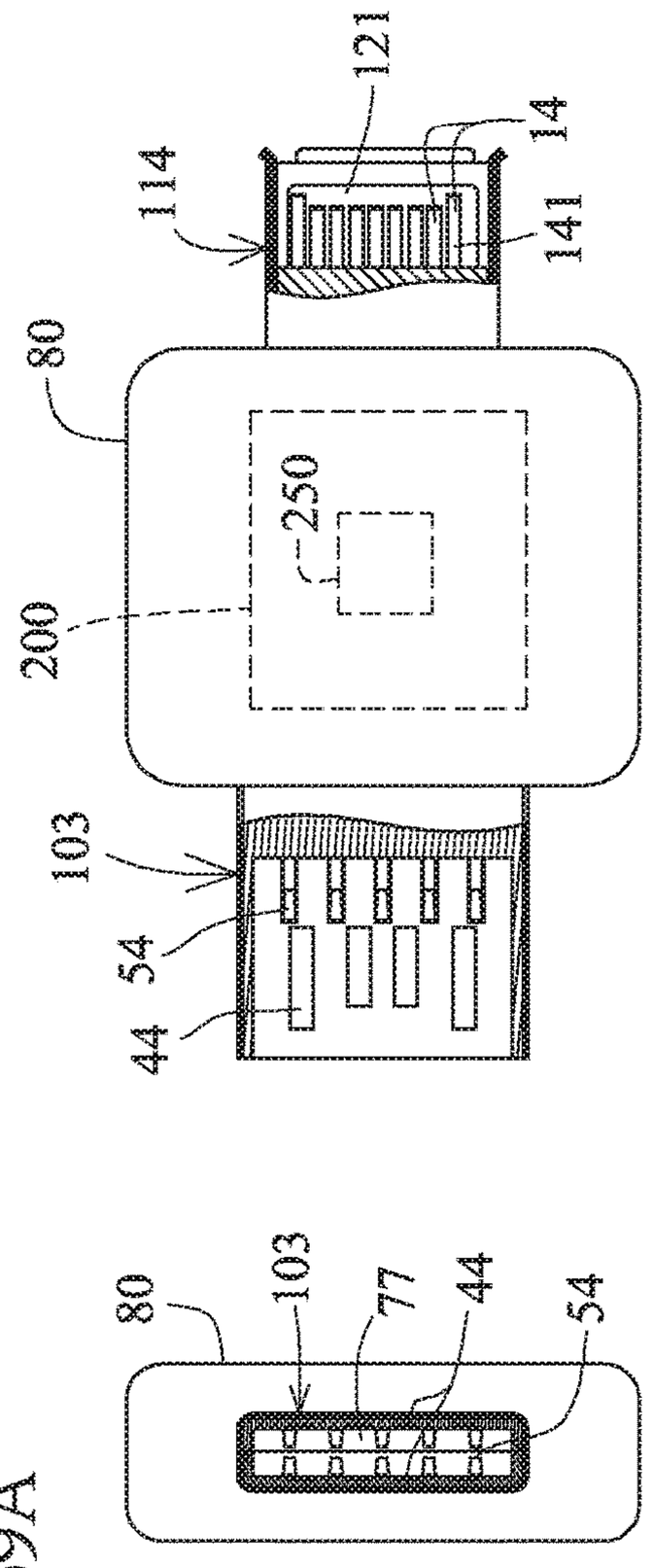


FIG. 70

FIG. 71

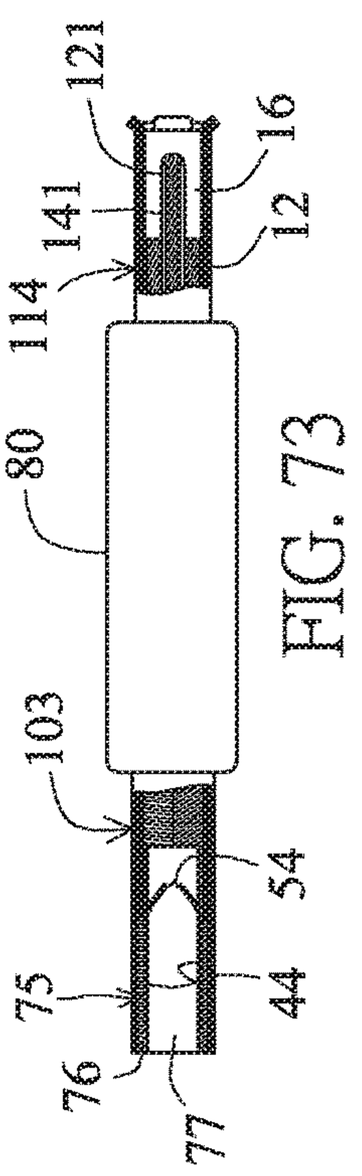


FIG. 73

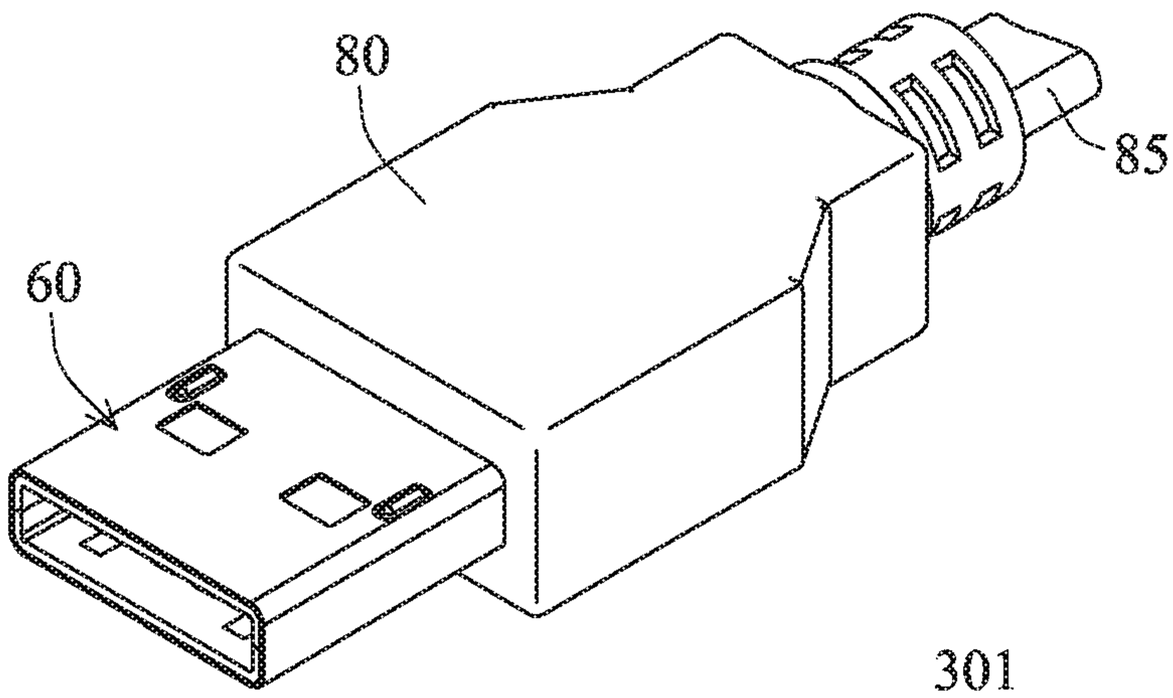


FIG. 75

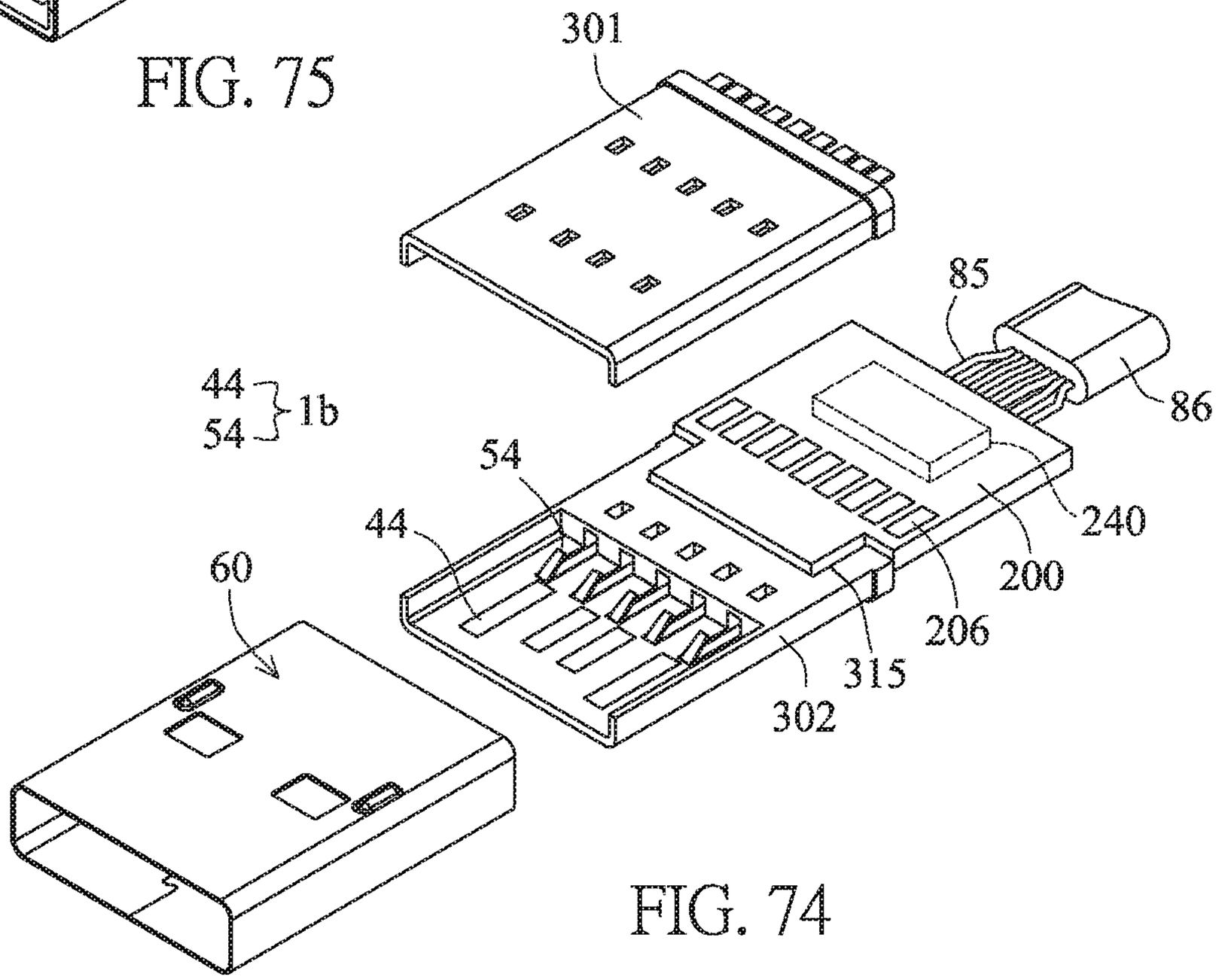


FIG. 74

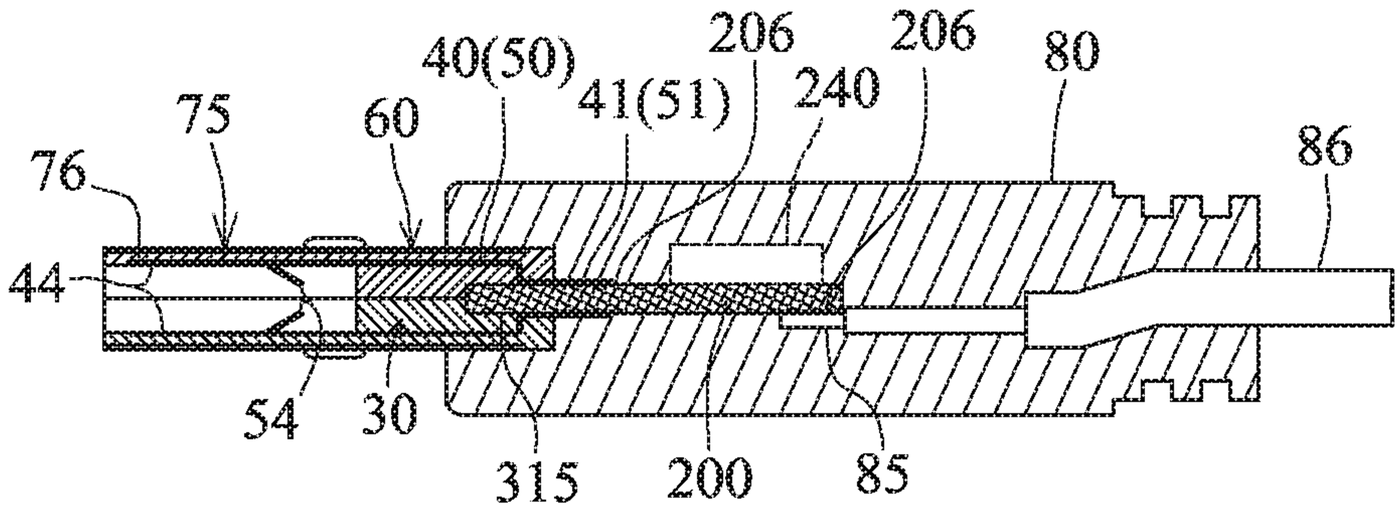


FIG. 76

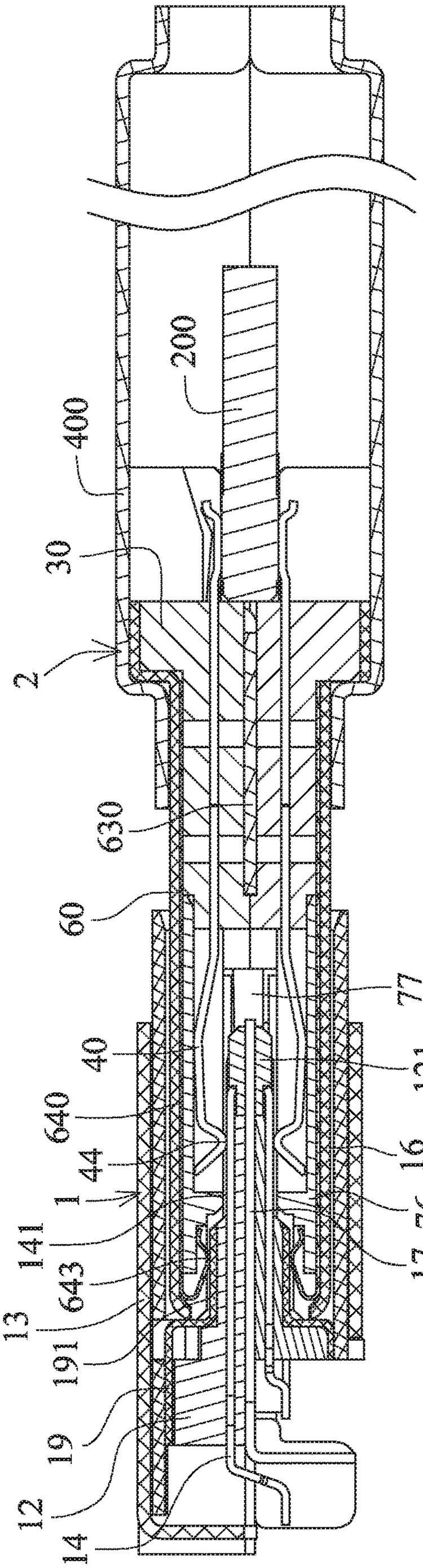

400
200
30
2
630
60
77
40
640
44
1
141
643
13
191
19
12
14
121
16
76
17

FIG. 77

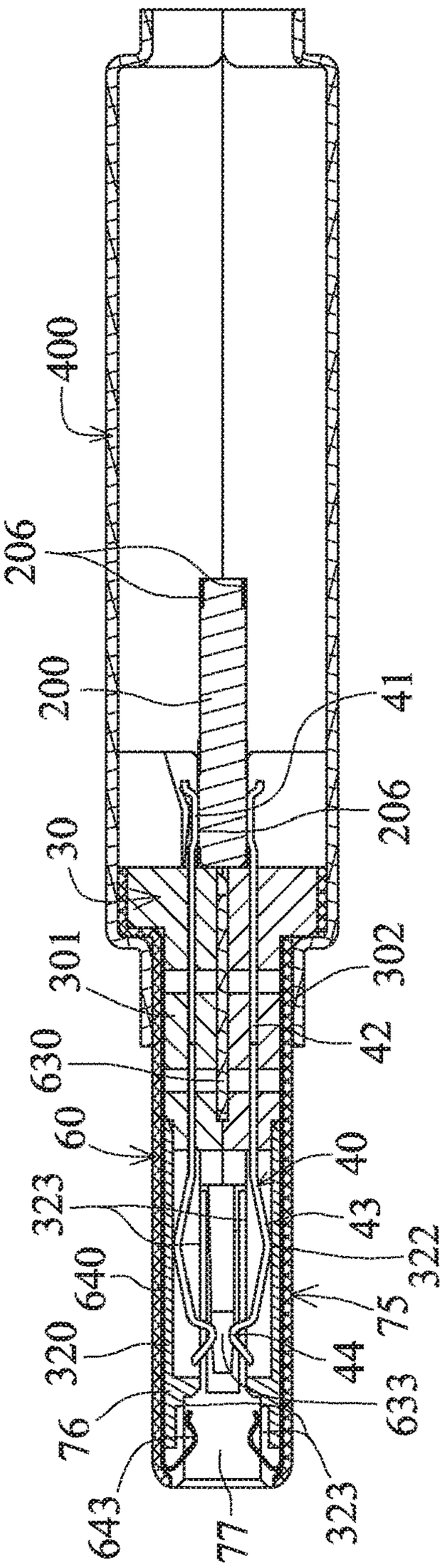

400
206
200
41
30
206
301
302
42
630
60
323
40
43
640
322
320
75
44
76
633
643
77
323

FIG. 78

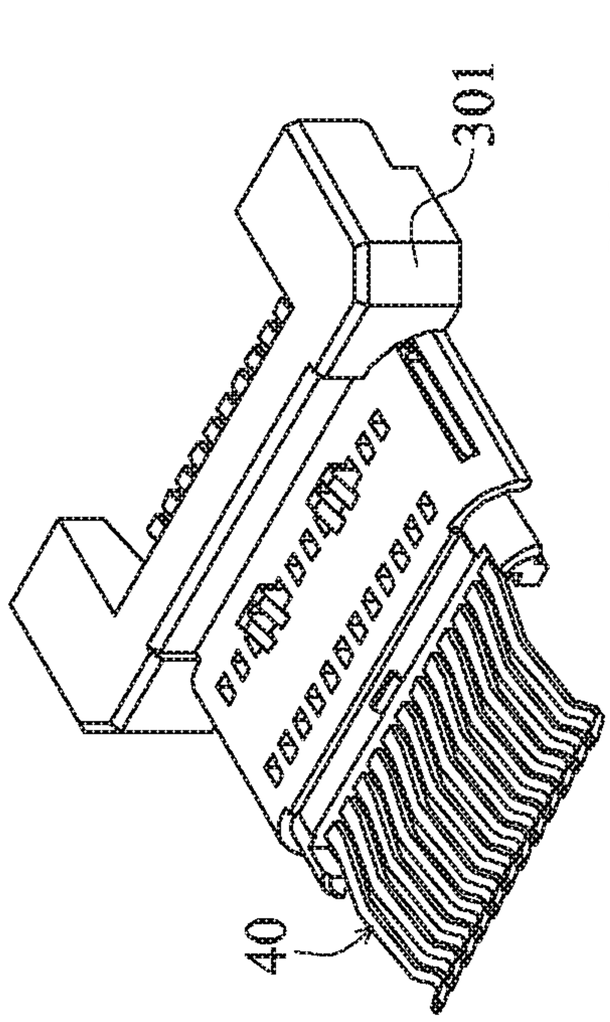


FIG. 80

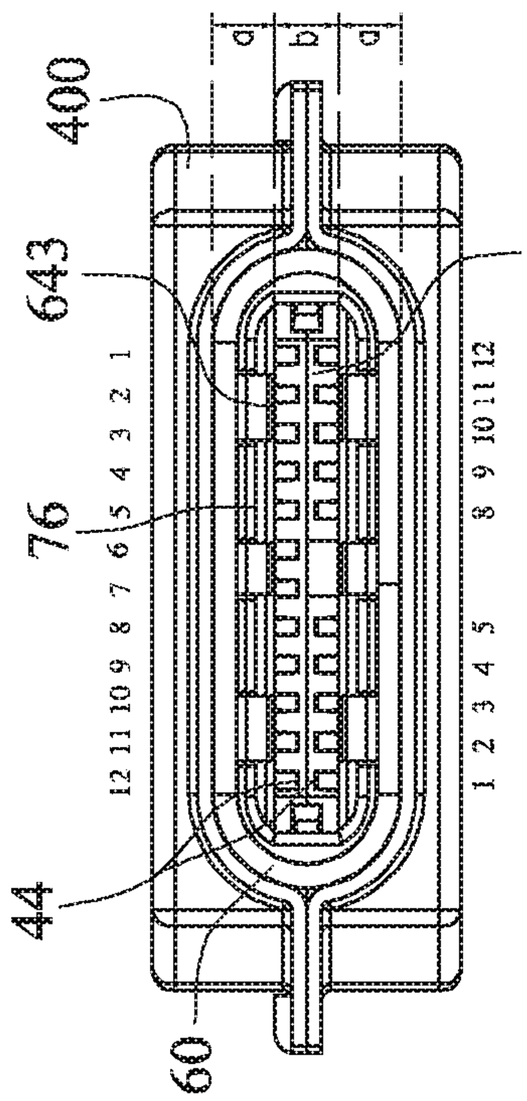
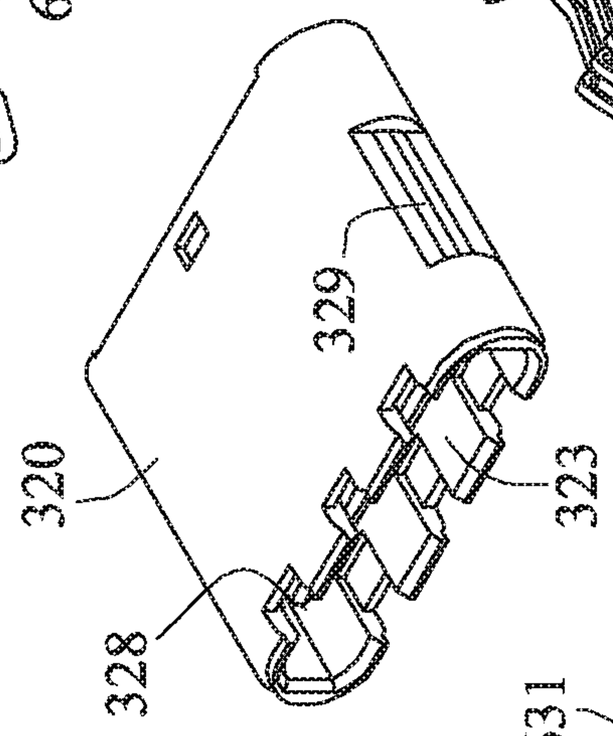


FIG. 79



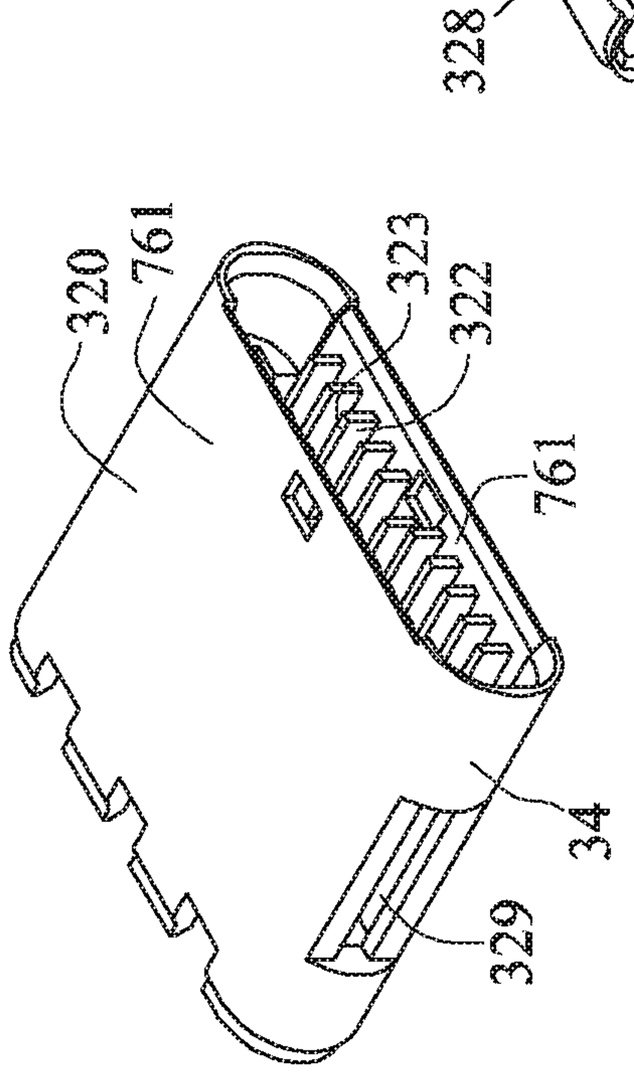


FIG. 81

FIG. 82

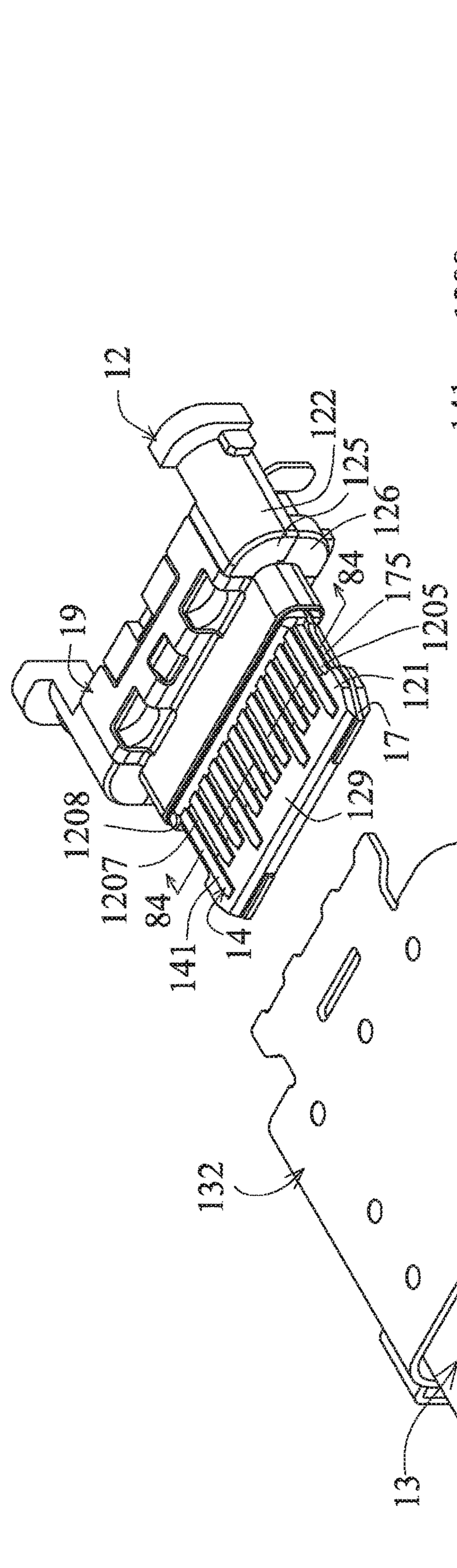


FIG. 83

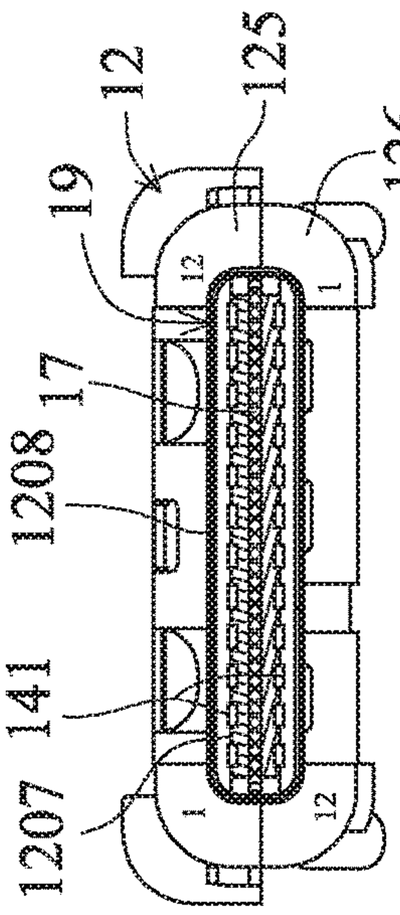


FIG. 84

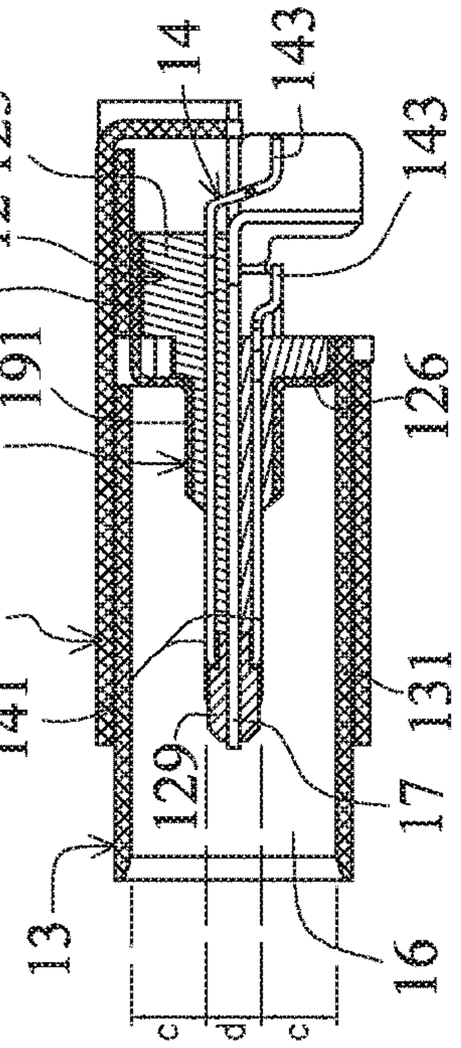


FIG. 85

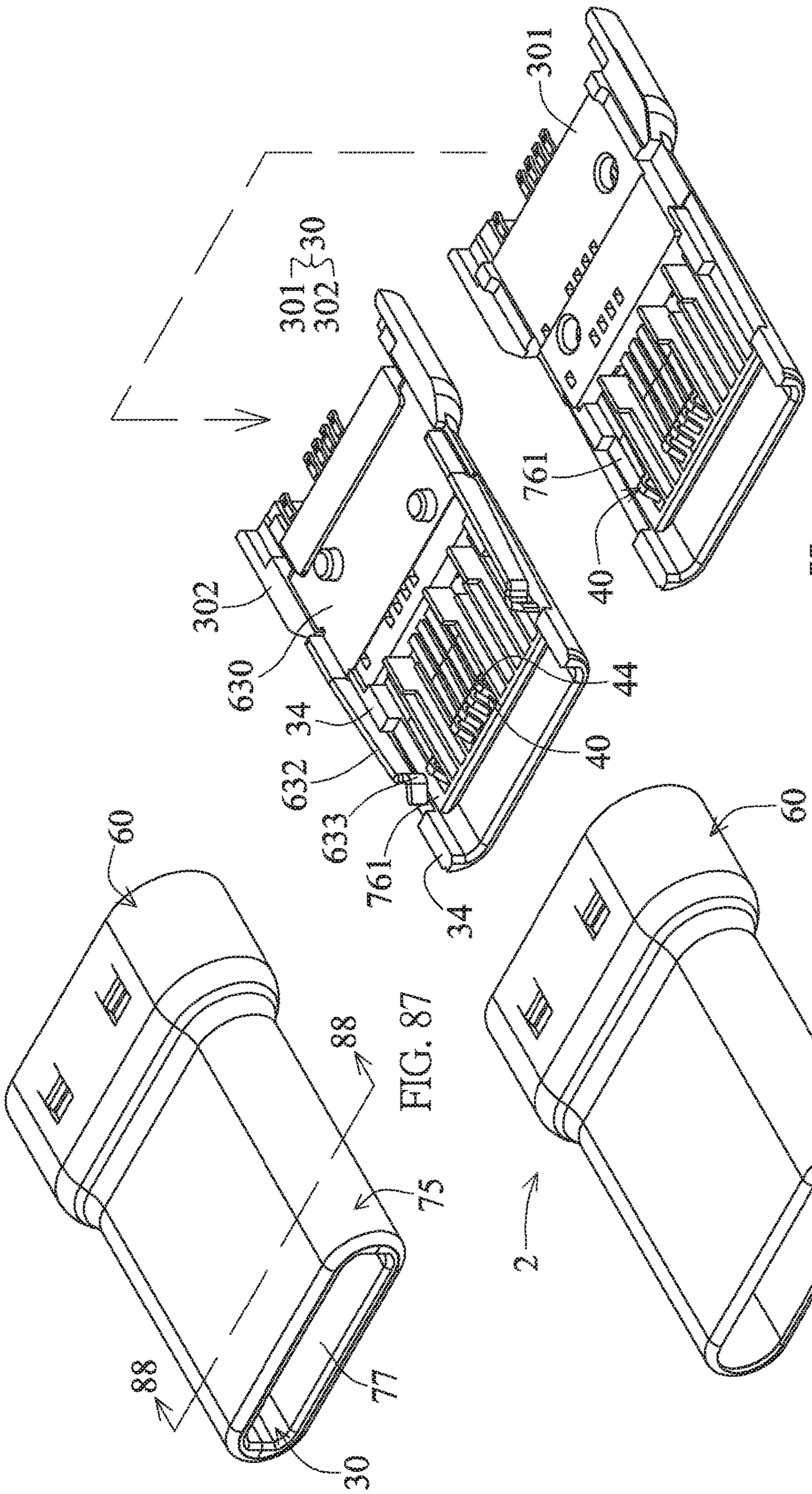


FIG. 86

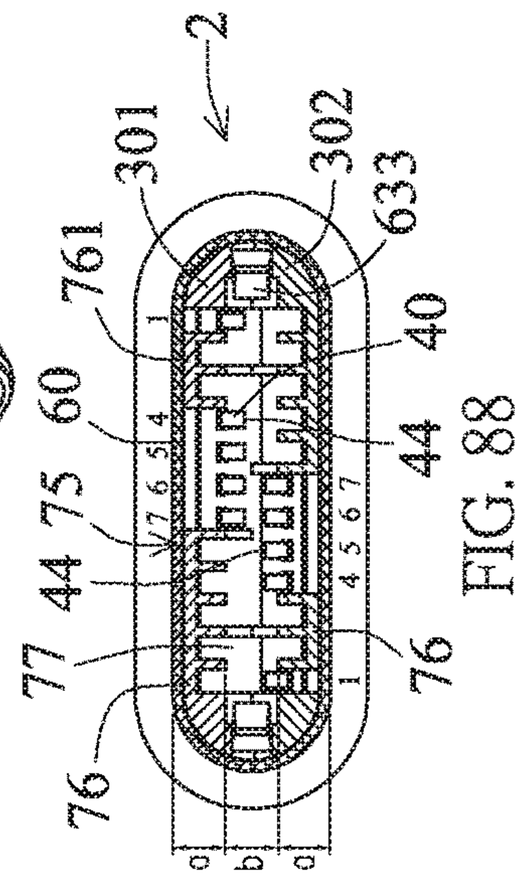


FIG. 88

FIG. 87

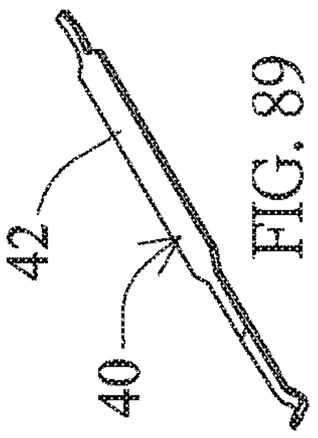


FIG. 89

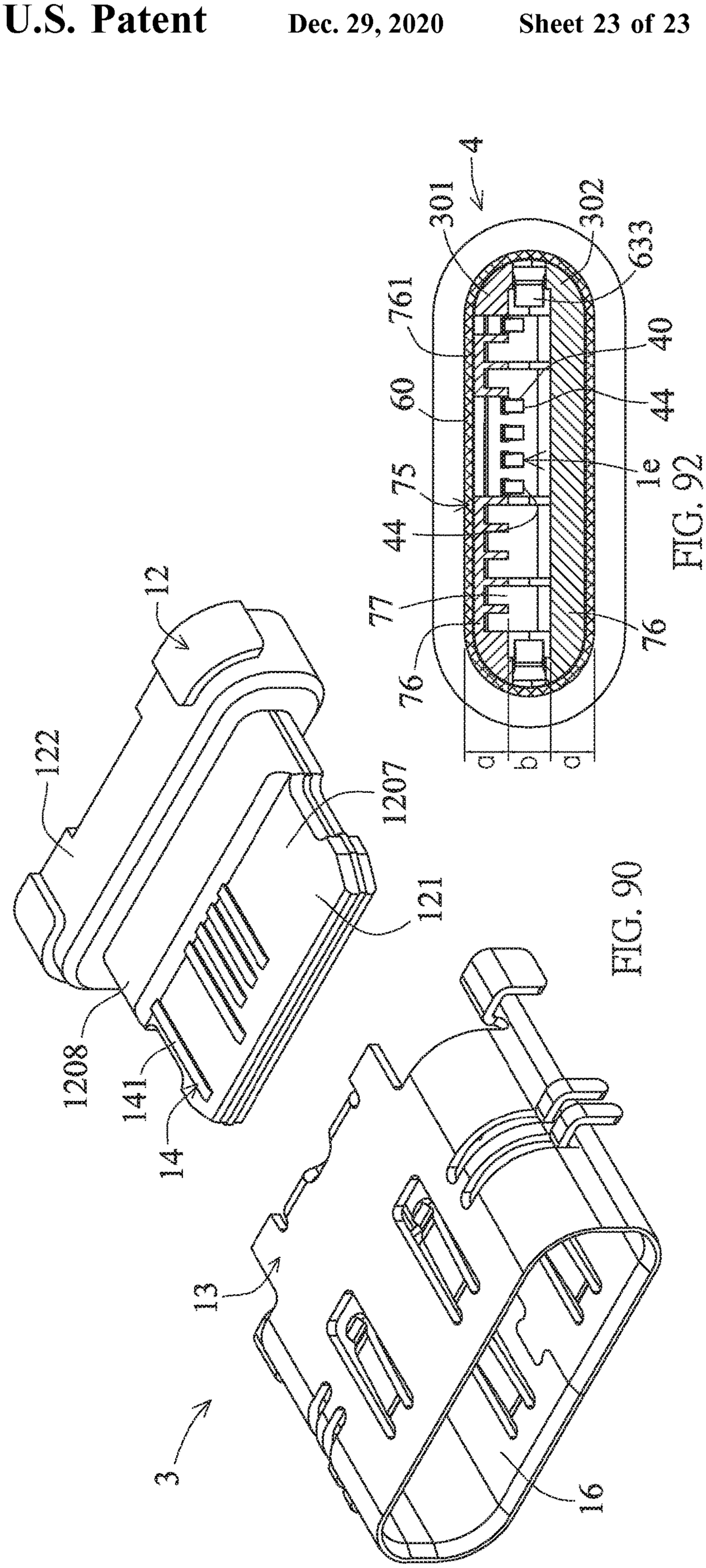


FIG. 90

FIG. 92

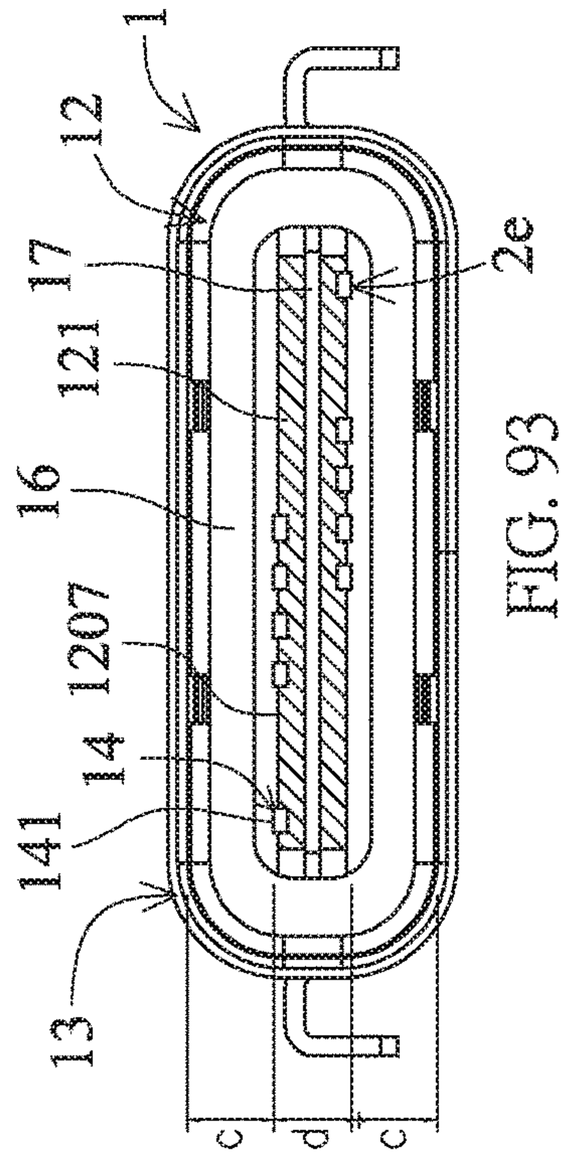


FIG. 93

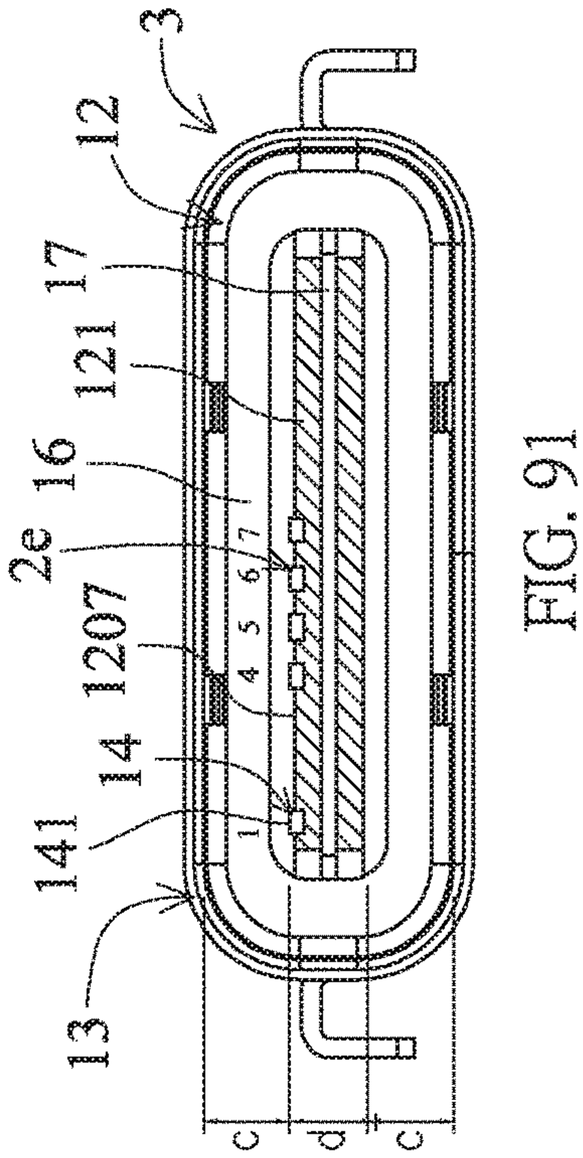


FIG. 91

BIDIRECTIONAL ELECTRICAL CONNECTION SOCKET, BIDIRECTIONAL ELECTRICAL CONNECTION PLUG AND COMBINATION THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Divisional Application of U.S. patent application Ser. No. 15/304,774, filed on Oct. 17, 2016, now issued as U.S. Pat. No. 9,960,551 B2, which is a national stage application of PCT Patent Application No. PCT/CN2015/076904, filed on Apr. 17, 2015, which claims priority to Chinese Patent Application No. 201420186527.3, filed on Apr. 17, 2014; Chinese Patent Application No. 201420268135.1, filed on May 23, 2014; and Chinese Patent Application No. 201520114091.1, filed on Feb. 17, 2015, the content of all of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The invention relates to an electrical connector, and more particularly to an electrical connection socket and an electrical connection plug capable of providing bidirectional electrical connections.

(2) Description of the Related Art

Today's most popular signal transmission specification in the computer apparatus is the universal serial bus (USB). A connector socket and a transmission cable manufactured according to this specification enable a peripheral apparatus, such as a mouse, a keyboard or the like, which is externally connected to the computer to be detected and used by the computer immediately.

At present, the USB electrical connection socket and the USB electrical connection plug have the unidirectional electrical connections. In order to ensure that the USB electrical connection plug can be electrically connected to the USB electrical connection socket when being inserted into the USB electrical connection socket, the socket and the plug have the mistake-proof designs. That is, the USB electrical connection plug cannot be reversely inserted, and the user switches to the other direction to insert the plug. The correct direction allows the insertion, so that the electrical connection can be ensured after the insertion.

At present, there are two specifications including USB 2.0 and USB 3.0, as shown in FIG. **1** and FIG. **2**, an A-type standard USB 2.0 electrical connection socket **10** specified by USB Association has an insulating base **12** and a metal housing **13**, the upper portion of the front end of the insulating base **12** has a horizontally frontwardly projecting tongue **121**. The metal housing **13** covers the insulating base **12** and is formed with a connection slot **16** covering the tongue **121**. The connection slot **16** is formed with a small space **161** and a large space **162** on top and bottom sides of the tongue **121**, respectively. The insulating base **12** is provided with one row of four first terminals **14**. The first terminal **14** has a vertically elastically movable contact **141** projecting beyond the bottom side of the tongue **121**. In addition, the top and bottom sides of the metal housing **13** projecting toward the connection slot **16** are provided with two resilient fasteners **131**.

The connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10** has the height of 5.12 mm, the tongue **121** has the height of 1.84 mm, the large space **162** has the height of 2.56 mm, and the small space **161** has the height of 0.72 mm. That is, (the height of the large space **162**)=(the height of the small space **161**)+(the height of the tongue **121**).

FIG. **3** shows an A-type standard USB 2.0 electrical connection plug **20** and an A-type standard USB 2.0 electrical connection socket **10** specified by USB Association. The A-type standard USB 2.0 electrical connection plug **20** has an insulating base **21**, a metal housing **22** and one row of four terminals **23**. The metal housing **22** covers the insulating base **21**. The connection portion of the A-type standard electrical connection plug has a fitting slot **24** fitting with the tongue **121**, and a contact interface substrate **25** fitting with the large space **162**. The outside layer of the contact interface substrate **25** is the metal housing, and the inside layer of the contact interface substrate **25** is the insulating base. The one row of four terminals **23** have contacts **231** in flat surface contact with the inner surface of the contact interface substrate **25** and facing the fitting slot **24**.

The connection portion of the A-type standard USB 2.0 electrical connection plug **20**, specified by USB Association, has the height of 4.5 mm, the fitting slot **24** has the height of 1.95 mm, the metal housing has the thickness of 0.3 mm, and the contact interface substrate **25** has the height of 2.25 mm.

As shown in FIG. **3**, the contact interface substrate **25** of the A-type standard USB 2.0 electrical connection plug **20** needs to be aligned with the large space **162** so that it can be inserted into the connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10**. The opposite insertion will fail because the contact interface substrate **25** having the height of 2.25 mm cannot be fit into the small space **161** having the height of 0.72 mm. So, the inconvenient use is caused.

However, in order to facilitate the convenient use, the bidirectional electrical connection can satisfy the requirement. So, the applicant previously developed an electrical connection socket, which has the duplex electrical connection function, and into which the A-type standard USB 2.0 electrical connection plug can be bidirectionally inserted for electrical connection, and then planed to develop a duplex electrical connection plug, which has the design adopting two contact interface substrates **25**, each having the height of 2.25 mm shown in FIG. **3**, in conjunction with the fitting slot **24** having the height of 1.95 m. However, this type of duplex electrical connection plug only can be electrically connected to the electrical connection socket having the duplex electrical connection function to achieve the doubled transmission speed. In addition, the two contact interface substrates of this type of duplex electrical connection plug cannot be fit for connection with the small space of the A-type standard USB 2.0 electrical connection socket. The above-mentioned duplex electrical connection socket, developed by the applicant, needs to be bidirectional inserted by the A-type standard USB 2.0 electrical connection plug for electrical connection. So, the overall height is higher than the A-type standard USB 2.0 electrical connection socket and is not advantageous to the slim and light electronic product. In addition, the further developed duplex electrical connection plug cannot work in conjunction with and cannot be bidirectionally inserted and connected to the A-type standard USB 2.0 electrical connection socket, is

significantly larger than the A-type standard USB 2.0 electrical connection plug, and cannot satisfy the actual requirement.

The applicant has continuously paid efforts to the research and development, and thus finally developed the invention, which is slim and light and can satisfy the bidirectional electrical connection to the standard electrical connection socket specified by USB Association.

In order to facilitate the examination, the embodiments corresponding to the amended independent claims are described in the following. Claim **1** may be implemented in FIGS. **11** to **14**, claim **2** may be implemented in FIGS. **61** to **62**, claim **4** may be implemented in FIGS. **70** to **73**, claim **24** may be implemented in FIG. **67**,**68**,**72**, claim **7** may be implemented in FIGS. **61** to **62**, claim **10** may be implemented in FIGS. **70** to **73**, claim **27** may be implemented in FIGS. **14** and **15**, claim **12** may be implemented in FIG. **30**, claim **13**, **14**, **28**, **29** may be implemented in FIGS. **28** to **29**, claims **30** to **31** may be implemented in FIGS. **61** to **62**, claims **15** to **16** may be implemented in FIGS. **70** to **73**, claims **17** to **19** may be implemented in FIGS. **28** to **29**, claim **14** may be implemented in FIGS. **67** to **68**, claim **21** may be implemented in FIGS. **70** to **73**, claim **22** may be implemented in FIGS. **74** to **76**, and claim **23** may be implemented in FIGS. **28** to **29**.

BRIEF SUMMARY OF THE INVENTION

A main object of the invention is to provide a bidirectional electrical connection plug, which can be bidirectionally inserted into and electrically connected to the standard electrical connection socket specified by USB Association to achieve the convenient use.

Another main object of the invention is to provide a bidirectional electrical connection plug, which can be bidirectionally inserted into and electrically connected to an electrical connection socket to achieve the convenient use, and has the low-height fitting portion to achieve the slim and light advantages.

Still another main object of the invention is to provide a bidirectional electrical connection socket, into which a bidirectional electrical connection plug can be bidirectionally inserted for electrically connection, to achieve the convenient use, and which has a low-height connection slot to achieve the slim and light advantages.

Yet still another main object of the invention is to provide a combination of a bidirectional electrical connection socket and a bidirectional electrical connection plug, in which the bidirectional electrical connection plug can be bidirectionally inserted into the bidirectional electrical connection socket to form the same electrical connection effect, to achieve the convenient use.

Yet still another main object of the invention is to provide a bidirectional electrical connection plug, which can be bidirectionally inserted into and electrically connected to an electrical connection socket, and has an insulating base comprising a base and a fitting member, wherein terminals of the two contact interfaces are embedded into and injection molded with the base, extensions of terminals of the two contact interfaces are vertically elastically movable and project beyond a front side of the base. The fitting member is fit with the front side of the base and covers the extensions of the terminals of the two contact interfaces to achieve the convenience in manufacturing.

Yet still another main object of the invention is to provide a bidirectional electrical connection plug having an insulating base having an upper base and a lower base stacked vertically, wherein the first and second bases can be embedded into and injection molded with at least one row of terminals, respectively, to achieve the convenience in manufacturing.

Yet still another main object of the invention is to provide a bidirectional electrical connection socket having an insulating base having a first base and a second base stacked vertically, wherein the first and second bases can be embedded into and injection molded with at least one row of terminals, respectively, to achieve the convenience in manufacturing.

A secondary object of the invention is to provide a combination of a bidirectional electrical connection socket and an electrical connection plug, in which the bidirectional electrical connection plug can be bidirectionally inserted into the bidirectional electrical connection socket to form the same electrical connection effect and achieve the doubled speed of transmission effects.

To achieve the above-identified objects, the invention provides a bidirectional electrical connection plug, which can be inserted and connected to a standard electrical connection socket specified by USB Association, wherein the standard electrical connection socket can be correspondingly inserted and connected to a standard electrical connection plug, specified by USB Association, the standard electrical connection socket has a connection slot, a tongue is disposed in the connection slot in a biased manner, two opposite sides of the tongue are formed with a large space and a small space, one set of contacts are disposed on one side of the tongue facing the large space, a connection portion of the standard electrical connection plug has a fitting slot and a contact interface substrate, the fitting slot is fit with the tongue, the contact interface substrate is fit with the large space, and the bidirectional electrical connection plug comprises: an insulating base; and a fitting portion, which is disposed on one end of the insulating base and can be inserted into the connection slot of the standard electrical connection socket; characterized in that the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between the two contact interface substrates is the fitting space, wherein at least one of the contact interface substrates has a contact interface electrically connected to the standard electrical connection socket, the contact interface is electrically connected to the other end of the insulating base, the fitting portion can be bidirectionally inserted into the connection slot of the standard electrical connection socket, heights of the two contact interface substrates can be fit into the small space, and the bidirectional electrical connection plug further has a positioning structure for positioning the insulating layers of the two contact interface substrates.

The invention further provides a bidirectional electrical connection plug, which can be inserted and connected to an electrical connection socket, wherein the electrical connection socket has a connection slot, a tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, and the bidirectional electrical connection plug comprises: an insulating base; and a fitting portion, which is disposed on one end of the insulating base and can be inserted into the connection slot of the electrical connection socket; characterized in that the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between two contact

interface substrates is the fitting space, wherein at least one of the contact interface substrates has a contact interface to be electrically connected to the electrical connection socket, the contact interface is electrically connected to the other end of the insulating base, the fitting portion can be bidirectionally inserted into the connection slot of the electrical connection socket, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, and the bidirectional electrical connection plug further has a positioning structure for positioning the insulating layers of the two contact interface substrates, the heights of the two contact interface substrates are smaller than heights of the contact interface substrates of the standard electrical connection plug according to claim **1** and larger than the small space of the connection slot of the standard electrical connection socket, wherein the standard electrical connection plug and the standard electrical connection socket have a minimum height specification specified by USB Association.

The invention further provides a bidirectional electrical connection plug, which can be inserted and connected to an electrical connection socket, wherein the electrical connection socket has a connection slot, a tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, and the bidirectional electrical connection plug comprises: an insulating base; and a fitting portion, which is disposed on one end of the insulating base and can be inserted into the connection slot of the electrical connection socket; characterized in that the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between two contact interface substrates is the fitting space, wherein at least one of the contact interface substrates has a contact interface to be electrically connected to the electrical connection socket, the contact interface is electrically connected to the other end of the insulating base, the fitting portion can be bidirectionally inserted into the connection slot of the electrical connection socket, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, and the bidirectional electrical connection plug further has a positioning structure for positioning the insulating layers of the two contact interface substrates, wherein the heights of the two contact interface substrates are smaller than heights of the contact interface substrates of the standard electrical connection plug according to claim **1** and larger than the small space of the connection slot of the standard electrical connection socket, and are smaller than or equal to 2.0 mm.

The invention further provides a bidirectional electrical connection plug, which can be inserted and connected to an electrical connection socket, wherein the electrical connection socket has a connection slot, a tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, and the bidirectional electrical connection plug comprises: an insulating base; and a fitting portion, which is disposed on one end of the insulating base and can be inserted into the connection slot of the electrical connection socket; characterized in that the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between two contact interface substrates is the fitting space, wherein the fitting portion can be bidirectionally inserted into the connection slot of the electrical connection socket, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, wherein the bidirectional electrical connection plug has a positioning structure for positioning the insulating layers of the two contact interface substrates, wherein only one of the contact interface substrates has a contact interface to be electrically connected to the electrical connection socket, and the contact interface is electrically connected to the other end of the insulating base.

The invention further provides a bidirectional electrical connection socket, to be inserted by and connected to a fitting portion of a bidirectional electrical connection plug, wherein the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, an interval of the two contact interface substrates is the fitting space, and the bidirectional electrical connection socket comprises: an insulating base, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, and the contact interface is electrically connected to the other end of the insulating base; and a connection slot, which is disposed on the one end of the insulating base and covers the tongue; characterized in that the tongue is disposed at a middle height of the connection slot, the symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, and heights of the spaces on the two connection surfaces are substantially the same as the small space of the standard electrical connection socket according to claim **1**.

The invention further provides a bidirectional electrical connection socket, to be inserted by and connected to a fitting portion of a bidirectional electrical connection plug, wherein the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, an interval of the two contact interface substrates is the fitting space, and the bidirectional electrical connection socket comprises: an insulating base, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, and the contact interface is electrically connected to the other end of the insulating base; and a connection slot, which is disposed on the one end of the insulating base and covers the tongue; characterized in that the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, heights of the spaces on the two connection surfaces are smaller than the large space of the standard electrical connection socket according to claim **1** and greater than the small space, and the standard electrical connection socket has a minimum height specification specified by USB Association.

The invention further provides a bidirectional electrical connection socket, to be inserted by and connected to a fitting portion of a bidirectional electrical connection plug,

wherein the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, an interval of the two contact interface substrates is the fitting space, and the bidirectional electrical connection socket comprises: an insulating base, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, and the contact interface is electrically connected to the other end of the insulating base; and a connection slot, which is disposed on the one end of the insulating base and covers the tongue; characterized in that the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, and heights of the spaces on the two connection surfaces are smaller than the large space of the standard electrical connection socket according to claim **1** and greater than the small space, and is smaller than 2.1 mm.

The invention further provides a bidirectional electrical connection socket, to be inserted by and connected to a fitting portion of a bidirectional electrical connection plug, wherein the fitting portion has two contact interface substrates having the same height and facing each other and a fitting space, an interval of the two contact interface substrates is the fitting space, and the bidirectional electrical connection socket comprises: an insulating base, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, and the contact interface is electrically connected to the other end of the insulating base; and a connection slot, which is disposed on the one end of the insulating base and covers the tongue; characterized in that the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, and only one of the two connection surfaces has the contact interface.

The invention further provides a combination of a bidirectional electrical connection socket and an electrical connection plug, comprising: an electrical connection socket, which has an insulating base and a connection slot, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface, the contact interface is electrically connected to the other end of the insulating base, the connection slot is formed on the one end of the insulating base, and the tongue is disposed in the connection slot; and an electrical connection plug, which has an insulating base and a fitting portion, wherein the fitting portion is disposed on the one end of the insulating base, the fitting portion of the electrical connection plug has two contact interface substrates facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between the two contact interface substrates is the fitting space, wherein at least one of the contact interface substrates has a contact interface to be electrically connected to the contact interface of the electrical connection socket; characterized in that the electrical connection plug further has a positioning structure for positioning the insulating layers of the two contact interface substrates, heights of the two contact interface substrates are the same and are smaller than the contact interface substrates of the standard electrical connection plug according to claim **1** and are smaller than or equal to 2 mm, the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on the two connection surfaces of the tongue, and heights of the spaces on the two connection surfaces are smaller than the large space of the standard electrical connection socket according to claim **1** and are smaller than 2.1 mm, wherein at least one of the electrical connection socket and the electrical connection plug has the two contact interfaces, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, the heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, and the fitting space is fit with the tongue.

The invention further provides a combination of a bidirectional electrical connection socket and an electrical connection plug, comprising: an electrical connection socket, which has an insulating base and a connection slot, wherein one end of the insulating base is projectingly formed with a tongue, at least one of two connection surfaces of the tongue has a contact interface, the contact interface is electrically connected to the other end of the insulating base, the connection slot is formed on the one end of the insulating base, and the tongue is disposed in the connection slot; and an electrical connection plug, which has an insulating base and a fitting portion, wherein the fitting portion is formed on the one end of the insulating base, the fitting portion of the electrical connection plug has two contact interface substrates facing each other and a fitting space, each of the two contact interface substrates has an insulating layer, and an interval between the two contact interface substrates is the fitting space, wherein at least one of the contact interface substrates has a contact interface to be electrically connected to the contact interface of the electrical connection socket; characterized in that heights of the two contact interface substrates are the same, the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on the two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, the heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, one of the bidirectional electrical connection socket and the bidirectional electrical connection plug has two contact interfaces, and the other of the bidirectional electrical connection socket and the bidirectional electrical connection plug has only one contact interface.

With the above-mentioned structure, the invention has the following advantages.

1. The bidirectional electrical connection plug of the invention can be bidirectionally inserted and electrically connected to the standard electrical connection socket specified by USB Association to achieve the convenient use.

2. The bidirectional electrical connection plug of the invention can be bidirectionally inserted into and electrically connected to an electrical connection socket to achieve the convenient use, and has the low-height fitting portion to achieve the slim and light advantages.

3. The bidirectional electrical connection socket of the invention can be bidirectionally inserted by and electrically connected to a bidirectional electrical connection plug to

achieve the convenient use, and the connection slot has the low height to achieve the slim and light advantages.

4. The invention provides a combination of a bidirectional electrical connection socket and an electrical connection plug, in which the bidirectional electrical connection plug can be bidirectionally inserted into the bidirectional electrical connection socket to form the same electrical connection effect to achieve the convenient use.

5. The invention provides a combination of a bidirectional electrical connection socket and an electrical connection plug, in which the bidirectional electrical connection plug can be bidirectionally inserted into the bidirectional electrical connection socket to form the same electrical connection effect and to achieve the doubled speed of transmission effects.

6. In the bidirectional electrical connection plug of the invention, the insulating base thereof comprises a base and a fitting member, terminals of the two contact interfaces and the base are embedded and injection molded together, extensions of terminals of the two contact interfaces are vertically elastically movable and project beyond a front side of the base, and the fitting member is fit with the front side of the base and covers extensions of terminals of the two contact interfaces to achieve the convenience in manufacturing.

7. In the electrical connection socket of the invention, the insulating base thereof has a first base and a second base stacked vertically, and the first and second bases and at least one row of terminals are embedded and injection molded together, respectively, to achieve the convenience in manufacturing.

8. In the bidirectional electrical connection plug of the invention, the insulating base thereof has an upper base and a lower base stacked vertically, and the first and second bases and at least one row of terminals are embedded and injection molded together, respectively, to achieve the convenience in manufacturing.

The above-mentioned and other objects, advantages and features of the invention will become more fully understood from the detailed description of the preferred embodiments given hereinbelow and the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a side cross-sectional view showing a conventional standard USB 2.0 electrical connection socket specified by USB Association.

FIG. **2** is a front view showing the conventional standard USB 2.0 electrical connection socket specified by USB Association.

FIG. **3** is a side cross-sectional view showing a conventional standard USB 2.0 electrical connection socket and a conventional standard USB 2.0 electrical connection plug specified by USB Association.

FIG. **4** is a side cross-sectional view showing a duplex plug according to a first embodiment of the invention.

FIG. **5** is a front cross-sectional view showing the duplex plug according to the first embodiment of the invention.

FIG. **6** is a top cross-sectional view showing the duplex plug according to the first embodiment of the invention.

FIG. **7** is a side cross-sectional view showing a used state of the duplex plug according to the first embodiment of the invention.

FIG. **8** is a side cross-sectional view showing a simplex socket according to the first embodiment of the invention.

FIG. **9** shows a front view according to a first embodiment of the invention.

FIG. **10** is a side cross-sectional view showing a combination of the simplex socket and the duplex plug according to the first embodiment of the invention.

FIG. **11** is a side cross-sectional view showing a duplex socket according to the first embodiment of the invention.

FIG. **12** is a front view showing the duplex socket according to the first embodiment of the invention.

FIG. **13** is a side cross-sectional view showing a combination of the duplex socket and the simplex plug according to the first embodiment of the invention.

FIG. **14** is a side cross-sectional view showing a combination of the duplex socket and the duplex plug according to the first embodiment of the invention.

FIG. **15** is a front cross-sectional view showing another duplex plug according to the first embodiment of the invention.

FIG. **16** is a front cross-sectional view showing another duplex plug according to the first embodiment of the invention.

FIG. **17** is a side cross-sectional view (taken at the position of the first terminal **40**) showing a duplex plug according to a second embodiment of the invention.

FIG. **18** is a front cross-sectional view showing the duplex plug according to the second embodiment of the invention.

FIG. **19** is a top cross-sectional view showing the duplex plug according to the second embodiment of the invention.

FIG. **20** is a side cross-sectional view (taken at the position of the second terminal **50**) showing the duplex plug according to the second embodiment of the invention.

FIG. **21** is an arranged top view showing two rows of terminals of the duplex plug according to the second embodiment of the invention.

FIG. **22** is a back cross-sectional view showing the duplex plug according to the second embodiment of the invention.

FIG. **23** is a side cross-sectional view showing a used state of the duplex plug according to the second embodiment of the invention.

FIG. **24** is a side cross-sectional view showing the used state of the duplex plug according to the second embodiment of the invention.

FIG. **25** is a side cross-sectional view (taken at the position of the first terminal **40**) showing another duplex plug according to the second embodiment of the invention.

FIG. **26** is a front view showing a simplex socket according to the second embodiment of the invention.

FIG. **27** is a side cross-sectional view showing the combination of the simplex socket and the duplex plug according to the second embodiment of the invention.

FIG. **28** is a front view showing a duplex socket according to the second embodiment of the invention.

FIG. **29** is a side cross-sectional view showing a combination of the duplex socket and the simplex plug according to the second embodiment of the invention.

FIG. **30** is a side cross-sectional view showing the combination of the duplex socket and the duplex plug according to the second embodiment of the invention.

FIG. **31** is a side cross-sectional view (taken at the position of the first terminal **40**) showing another duplex plug according to the second embodiment of the invention.

FIG. **32** is a side cross-sectional view (taken at the position of the second terminal **50**) showing another duplex plug according to the second embodiment of the invention.

FIG. **33** is a side cross-sectional view showing a used state of another duplex plug according to the second embodiment of the invention.

FIG. **34** is a side cross-sectional view showing a duplex plug according to the third embodiment of the invention.

FIG. **35** is a front cross-sectional view showing the duplex plug according to the third embodiment of the invention.

FIG. **36** is a top cross-sectional view showing the duplex plug according to the third embodiment of the invention.

FIG. **37** is a side cross-sectional view showing a used state of the duplex plug according to the third embodiment of the invention.

FIG. **38** is a side cross-sectional view showing a simplex socket according to the third embodiment of the invention.

FIG. **39** is a front view showing the simplex socket according to the third embodiment of the invention.

FIG. **40** is a side cross-sectional view showing a combination of the simplex socket and the duplex plug according to the third embodiment of the invention.

FIG. **41** is a side cross-sectional view showing a duplex socket according to the third embodiment of the invention.

FIG. **42** is a front view showing the duplex socket according to the third embodiment of the invention.

FIG. **43** is a side cross-sectional view showing a combination of the duplex socket and the simplex plug according to the third embodiment of the invention.

FIG. **44** is a side cross-sectional view showing a combination of the duplex socket and the duplex plug according to the third embodiment of the invention.

FIG. **45** shows a front cross-sectional view according to a fourth embodiment of the invention.

FIG. **46** shows a front cross-sectional view according to a fifth embodiment of the invention.

FIG. **47** shows a front cross-sectional view according to a sixth embodiment of the invention.

FIG. **48** shows a top view according to a seventh embodiment of the invention.

FIG. **48**A shows a cross-sectional view according to the seventh embodiment of the invention.

FIG. **49** shows a top view according to an eighth embodiment of the invention.

FIG. **49**A shows a cross-sectional view according to the eighth embodiment of the invention.

FIG. **50** shows a top view according to a ninth embodiment of the invention.

FIG. **50**A shows a cross-sectional view according to the ninth embodiment of the invention.

FIG. **51** shows a top view according to a tenth embodiment of the invention.

FIG. **51**A shows a cross-sectional view according to the tenth embodiment of the invention.

FIG. **52** shows a side cross-sectional exploded view according to an eleventh embodiment of the invention.

FIG. **53** shows a side cross-sectional combination view according to the eleventh embodiment of the invention.

FIG. **54** shows a front cross-sectional combination view according to the eleventh embodiment of the invention.

FIG. **55** shows a side cross-sectional exploded view according to the eleventh embodiment of the invention.

FIG. **56** shows a side cross-sectional combination view according to the eleventh embodiment of the invention.

FIG. **57** shows a front cross-sectional combination view according to the eleventh embodiment of the invention.

FIG. **58** shows a side cross-sectional exploded view according to a twelfth embodiment of the invention.

FIG. **59** shows a side cross-sectional combination view according to the twelfth embodiment of the invention.

FIG. **60** shows a front cross-sectional combination view according to the twelfth embodiment of the invention.

FIG. **61** shows a side cross-sectional exploded view according to the twelfth embodiment of the invention.

FIG. **62** shows a side cross-sectional combination view according to the twelfth embodiment of the invention.

FIG. **63** shows a side cross-sectional combination view according to the twelfth embodiment of the invention.

FIG. **64** is a pictorial view showing a plug according to a thirteenth embodiment of the invention.

FIG. **65** is a top cross-sectional view showing the plug according to the thirteenth embodiment of the invention.

FIG. **66** is a side cross-sectional view showing the plug according to the thirteenth embodiment of the invention.

FIG. **67** is a pictorial view showing a socket according to the thirteenth embodiment of the invention.

FIG. **68** is a front view showing the socket according to the thirteenth embodiment of the invention.

FIG. **69** shows a top cross-sectional view according to a 14^{th} embodiment of the invention.

FIG. **69**A is a front cross-sectional view showing the plug at one end according to the 14^{th} embodiment of the invention.

FIG. **70** shows a top cross-sectional view according to a 15^{th} embodiment of the invention.

FIG. **71** is a front cross-sectional view showing the plug at one end according to the 15^{th} embodiment of the invention.

FIG. **72** is a front cross-sectional view showing the socket at the other end according to the 15^{th} embodiment of the invention.

FIG. **73** shows a side cross-sectional view according to the 15^{th} embodiment of the invention.

FIG. **74** shows a pictorially exploded view according to a 16^{th} embodiment of the invention.

FIG. **75** shows a pictorially assembled view according to the 16^{th} embodiment of the invention.

FIG. **76** shows a side cross-sectional view according to the 16^{th} embodiment of the invention.

FIG. **77** is a side cross-sectional combination view showing the socket and the plug according to a 17^{th} embodiment of the invention.

FIG. **78** is a side cross-sectional view showing the plug according to the 17^{th} embodiment of the invention.

FIG. **79** is a front view showing the plug according to the 17^{th} embodiment of the invention.

FIG. **80** is a pictorially exploded view showing the plug according to the 17^{th} embodiment of the invention.

FIG. **81** is a pictorial view showing a fitting member of the plug according to the 17^{th} embodiment of the invention.

FIG. **82** is a side view showing a metal partition plate of the plug according to the 17^{th} embodiment of the invention.

FIG. **83** is a side cross-sectional combination view showing the socket according to the 17^{th} embodiment of the invention.

FIG. **84** is a front view showing an insulating base of the socket according to the 17^{th} embodiment of the invention.

FIG. **85** is a side cross-sectional combination view showing the socket according to the 17^{th} embodiment of the invention.

FIG. **86** is a pictorially exploded view showing a plug according to an 18^{th} embodiment of the invention.

FIG. **87** is a pictorial view showing the plug according to the 18^{th} embodiment of the invention.

FIG. **88** is a front cross-sectional view showing the plug according to the 18^{th} embodiment of the invention.

FIG. **89** is a pictorial view showing a terminal of the plug according to the 18^{th} embodiment of the invention.

FIG. **90** is a pictorially exploded view showing a socket according to the 18^{th} embodiment of the invention.

FIG. **91** is a front view showing the socket according to the 18^{th} embodiment of the invention.

FIG. **92** is a front cross-sectional view showing a plug according to a 19^{th} embodiment of the invention.

FIG. **93** is a front view showing a socket according to the 19^{th} embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. **4** to **16**, the first embodiment of the invention provides a bidirectional USB 2.0 electrical connection plug and a bidirectional USB 2.0 electrical connection socket.

Referring to FIGS. **4** to **6**, a bidirectional duplex USB 2.0 electrical connection plug **100** of this embodiment comprises an insulating base **30**, two rows of first terminals **40**, a metal housing **60**, a fitting portion **75**, a positioning structure **34***a* and a rear plug **70**.

The insulating base **30** is plastically injection molded and has a front segment formed with a fitting space **77**. The insulating base **30** forms top, bottom, left and right sides of the fitting space **77**. The cross-section of the front segment of the insulating base **30** is a hollow rectangular frame structure. The insertion port of the fitting space **77** faces frontwards. The insulating base **30** has two rows of first terminal slots **31**, wherein a middle of the first terminal slot **31** has a concave portion **32**.

The metal housing **60** covers the insulating base **30**. The front-view shape of the metal housing **60** is rectangular, top-bottom symmetrical and left-right symmetrical. As shown in FIG. **7**, the metal housing **60** has an open back end and has no projecting upright plate sheet.

The fitting portion **75** is disposed at the front end of the insulating base **30**. The fitting portion **75** has two opposite contact interface substrates **76** and a fitting space **77**. The two contact interface substrates **76** each having an insulating layer **761** are separated by the fitting space **77**. The insulating layers **761** of the inside layers of the two contact interface substrates **76** are integrally formed jointly with the insulating base **30**, and the outside layers of the contact interface substrates **76** pertain to the metal housing **60**. The fitting space **77** is the same as the fitting space **77** of the insulating base **30**. The insulating layers **761** of the inside layers of the two contact interface substrates **76** are the top and bottom sides of the fitting space **77**. Each of the two contact interface substrates **76** has a USB 2.0 contact interface **1***a* to be electrically connected to an A-type standard USB 2.0 electrical connection socket. The two USB 2.0 contact interfaces **1***a* are formed by the two rows of first terminals **40**. The two USB 2.0 contact interfaces **1***a* are electrically connected to the rear end of the insulating base **30**, and the two USB 2.0 contact interfaces **1***a* have the same contact interface and the connection points with the circuit serial numbers arranged reversely. The fitting portion **75** has the rectangular external shape in a top-bottom symmetrical and left-right symmetrical manner. The fitting portion **75** can be bidirectionally inserted into the connection slot of the A-type standard USB 2.0 electrical connection socket. The two contact interface substrates **76** can be fit into the small space.

The positioning structure **34***a* is integrally formed jointly with front segments of two sidewalls **34** of the insulating base **30**. The two sidewalls **34** are integrally connected to two sides of the insulating layers of the two contact interface substrates **76** to position the insulating layers **761** of the two contact interface substrates **76**. The insulating layers **761** of the two contact interface substrates **76** are the top and bottom sides of the fitting space **77**. The two sidewalls **34** are the left and right sides of the fitting space **77**.

The two rows of first terminals **40** each having four first terminals are assembled and fixed to the two rows of first terminal slots **31** of the insulating base **30**, the first terminal **40** sequentially has, from one end to the other end, a pin **41**, a fixing portion **42** and an extension **43**. The fixing portion **42** is fixed to the first terminal slot **31**. The extension **43** is connected to the front end of the fixing portion **42**, extends to the contact interface substrate **76** and has a contact **44**. The contact **44** is not elastically movable and is flush with the inner surface of the contact interface substrate **76**. The front end of the extension **43** has an engagement portion **45** engaged into the engagement hole formed at the front end of the concave portion **32**. The pin **41**, which is connected to the other end of the fixing portion **42** and projects beyond the rear end of the insulating base **30**, has a distal segment formed with a wiring portion **411**. The contacts **44** of the two rows of first terminals **40** respectively form the USB 2.0 contact interfaces **1***a* of the two contact interface substrates **76**. The two USB 2.0 contact interfaces **1***a* are the same contact interface and have the connection points with the circuit serial numbers arranged reversely, as shown in FIG. **5**. The upper USB 2.0 contact interface **1***a* has the connection points with the circuit serial numbers of 1, 2, 3, 4 from left to right, and the lower USB 2.0 contact interface **1***a* has the connection points with the circuit serial numbers of 4, 3, 2, 1 from left to right. According to the USB 2.0 contact interface specified by USB Association, the connection point with the circuit serial number 1 is the ground contact, the connection point with the circuit serial number 4 is the power contact, and the connection points with the circuit serial numbers 3 and 2 are one pair of signal contacts represented by D+ and D−, respectively.

The rear plug **70** is tightly fit within the rear segment of the metal housing and at the rear end of the insulating base. The rear plug **70** is a three-piece combination so that the pins **41** of the two rows of first terminals **40** can pass through and closely fit with the rear plug **70**. The rear plug **70** mainly plugs the voids communicating the two rows of first terminal slots **31** with the rear end of the insulating base **30**.

This embodiment functions as a connector of a connection cable. An insulating housing **80** covering the rear segment of the metal housing **60** is formed by way of glue pouring. The provision of the rear plug **70** can prevent the glue liquid from flowing into the first terminal slot **31** in the glue pouring process. Regarding the wiring portions **411** of the pins of the two rows of first terminals **40**, the connection points with the same circuit serial number is connected to the same wire **85**.

Referring to FIG. **7**, with the above-mentioned structure, the heights of the two contact interface substrates **76** of the fitting portion **75** can be fit into the small space **161** of the connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10**, and the USB 2.0 contact interface **1***a* (contacts **44**) of one of the two contact interface substrates **76** is electrically connected to the USB 2.0 contact interface **2***a* (contacts **141**) below the tongue **121** of the A-type standard USB 2.0 electrical connection socket **10**.

The two contact interface substrates **76** of the fitting portion **75** of this embodiment have the same height of about 0.65 mm, and the fitting space **77** is about 1.95 mm, so the height of the fitting portion **75** is about 3.25 mm, which is significantly lower than the height (4.5 mm) of the connec-

tion portion of the A-type standard USB 2.0 electrical connection plug **20**, and higher than the large space **162** (2.65 mm) of the connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10**. Thus, the fitting portion **75** cannot be incorrectly inserted into the large space **162** when being used. Upon designing, however, the height of the contact interface substrate **76** may range between 0.5 mm and 0.85 mm, and the height of the fitting portion **75** may range between 3 mm and 4 mm.

According to the above-mentioned descriptions, the plug of this embodiment has the following advantages.

1. The fitting portion **75** can be bidirectionally inserted into the connection slot **16** of the A-type standard USB 2.0 electrical connection socket **10** for electrical connection, and can be used in a very convenient manner.

2. The height of the fitting portion **75** is about 3.25 mm significantly lower than the height (4.5 mm) of the connection portion of the A-type standard USB 2.0 electrical connection plug **20**, and has the slim and light advantages.

3. The structure is simplified and can be easily manufactured.

Referring to FIGS. **8** and **9**, a bidirectional simplex USB 2.0 electrical connection socket **90** of this embodiment comprises an insulating base **92**, a metal housing **93**, one row of first terminals **94** and a rear cover **97**.

The insulating base **92** is plastically injection molded and has a front end with a middle projectingly formed with a horizontally extending tongue **921**, wherein the bottom side of the tongue **921** has a USB 2.0 contact interface **2***a*. The USB 2.0 contact interface **2***a* is formed by the one row of first terminals **94**. The contact interface is electrically connected to the rear end of the insulating base **30**.

The metal housing **93** covers the insulating base **92** and the tongue **921** to form a connection slot **96** at the front end of the insulating base **92**. The tongue **921** is disposed at a middle height of the connection slot **96**. Two symmetrical spaces **961** are formed on the upper and lower connection surfaces **922** of the tongue **921**. The external shape of the connection slot **96** is rectangular, top-bottom symmetrical and left-right symmetrical.

The one row of first terminals **94** are assembled or embedded into the insulating base **92**. Each terminal has a pin **941**, a fixing portion **942** and an extension **943**. The fixing portion **942** is fixed to the insulating base **92**. The extension **943** connected to the front end of the fixing portion **942** extends to the tongue **921** and has a contact **944**. The contact **944** projecting beyond the bottom side of the tongue **921** is vertically elastically movable. The pin **941** connected to the rear end of the fixing portion **942** projects beyond the insulating base. The contacts **944** of the one row of first terminals **94** form the USB 2.0 contact interface **2***a*.

The rear cover **97** covers the rear and bottom of the insulating base **92** to position the pins **941** of the one row of first terminals **94**.

This embodiment is characterized in that the spaces of the connection slot **96** on the upper and lower connection surfaces of the tongue **921** have the same height of about 0.72 mm, which is smaller than the large space **162** of the A-type standard USB 2.0 electrical connection socket and is substantially equal to the small space. The height of the tongue **921** is still 1.84 mm. The height of the connection slot **96** is about 3.3 mm, which is significantly lower than the A-type standard USB 2.0 electrical connection socket **10**. A fitting portion of an electrical connection plug can be bidirectionally inserted into the connection slot **96**.

Referring to FIG. **10**, with the above-mentioned structure, the heights of the two contact interface substrates **76** of the fitting portion **75** of the bidirectional duplex USB 2.0 electrical connection plug **100** can be fit into the two spaces **961** on the upper and lower connection surfaces **922** of the tongue **921** of the connection slot **96**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the bidirectional simplex USB 2.0 electrical connection socket **90**, and the USB 2.0 contact interface **1***a* (contacts **44**) of one of the two contact interface substrates **76** is electrically connected to the USB 2.0 contact interface **2***a* (contacts **944**) of the bottom side of the tongue **921** of the bidirectional simplex USB 2.0 electrical connection socket **90**. In addition, both of the fitting portion **75** of the bidirectional duplex USB 2.0 electrical connection plug and the connection slot **96** of the bidirectional simplex USB 2.0 electrical connection socket **90** can achieve the better fitting. That is, the two contact interface substrates **76** and the two spaces **961** on the upper and lower connection surfaces **922** of the tongue **921** of the connection slot **96** are tightly fit, each of two first fitting gaps **962** respectively between the two contact interface substrates **76** and an upper surface **965** and a lower surface **966** of the connection slot **96** is smaller than 0.01 mm, and each of second fitting gaps **963** left after the two spaces **961** are respectively fit with the contact interface substrates **76** is smaller than 0.15 mm. So, this is different from FIG. **7**, in which a too large space is still left when the contact interface substrate **76** is in the large space **162**.

Regarding the design of this embodiment, the spaces of the connection slot **96** on the upper and lower connection surfaces of the tongue **921** may have the same height or different heights, wherein the height may range between 0.55 mm and 2.1 mm. The height of the connection slot **96** may be designed to range between 3 mm and 6 mm. Thus, the height of the contact interface substrate matching with the inserted bidirectional USB 2.0 electrical connection plug ranges between 0.5 mm and 2.0 mm, and the height of the fitting portion ranges between 3 mm and 6 mm.

Referring to FIGS. **11** and **12**, a USB 2.0 bidirectional duplex electrical connection socket **901** of this embodiment is almost the same as the bidirectional simplex USB 2.0 electrical connection socket **90** except for the differences that there is additionally provided with one row of first terminals **94**, and that the top side of the tongue **921** is also formed with a USB 2.0 contact interface **2***a*. The USB 2.0 contact interfaces **2***a* on the top and bottom sides of the tongue **921** have the same contact interface, and the connection points with the circuit serial numbers arranged reversely.

Referring to FIG. **13**, a bidirectional simplex USB 2.0 electrical connection plug **104** is almost the same as the bidirectional duplex USB 2.0 electrical connection plug **100** except for the difference that only one of the two contact interface substrates **76** of the fitting portion **75** has the USB 2.0 contact interface **1***a*. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the bidirectional duplex USB 2.0 electrical connection socket **901**, and the USB 2.0 contact interface **1***a* (contacts **44**) of the contact interface substrate **76** is inevitably electrically connected to one of the USB 2.0 contact interfaces **2***a* (contacts **944**) on the top and bottom sides of the tongue **921** of the bidirectional duplex USB 2.0 electrical connection socket **901**.

Referring to FIG. **14**, the fitting portion **75** of the bidirectional duplex USB 2.0 electrical connection plug **100** can be bidirectionally inserted into the connection slot **96** of the bidirectional duplex USB 2.0 electrical connection socket **901**, so that the two USB 2.0 contact interfaces **1***a* and **2***a* of the plug and the socket can be bidirectionally connected to

achieve the convenient use and the doubled transmission speed. However, the plug and the socket of this embodiment are slimmer and lighter than those of the prior art.

As shown in FIGS. **14** and **13**, the two contact interface substrates **76** of the plug and the spaces on the upper and lower connection surfaces of the tongue **921** of the connection slot **96** of the socket are tightly fit, wherein the fitting gap is smaller than 0.15 mm.

The socket of this embodiment has two contact interfaces, so the socket is electrically connected to a circuit board. The circuit board may have cascaded circuits to electrically connect the connection points of the two contact interfaces of the socket with the same circuit serial number to the same circuit to form one set of circuits. Thus, it can work in conjunction with a bidirectional simplex electrical connection plug to perform the bidirectional corresponding connection.

Referring to FIG. **15**, another modification of the bidirectional duplex USB 2.0 electrical connection plug of this embodiment is provided with the difference that the insulating base **30** is formed by stacking an upper base **301** and a lower base **302**, wherein the cross-section of the front segment of the upper base **301** is inversely U-shaped, and the cross-section of the front segment of the lower base **302** is U-shaped. Each of the upper and lower bases **301** and **302** is embedded into and injection molded with one row of first terminals **40**. Each of the upper and lower bases **301** and **302** forms the insulating layer of the contact interface substrate **76**. An L-shaped reinforcing sheet **35** is assembled with or embedded into each of the left and right sides of the insulating layers of the two contact interface substrates **76**.

In addition, each of the upper and lower bases **301** and **302** may be formed with one row of terminal slots, into which one row of first terminals are assembled.

Referring to FIG. **16**, another modification of the bidirectional duplex USB 2.0 electrical connection plug of this embodiment is provided with the differences that the reinforcing sheet **35** is horizontal I shaped, and that the insulating base **30** is integrally embedded into and injection molded with the two rows of first terminals.

Referring to FIGS. **17** to **33**, the second embodiment of the invention provides a bidirectional USB 3.0 electrical connection plug and a bidirectional USB 3.0 electrical connection socket.

Referring to FIGS. **17** to **20**, a bidirectional duplex USB 3.0 electrical connection plug **103** of this embodiment is almost the same as the first embodiment except for the differences that two rows of five second terminals **50** are further provided, that the insulating base **30** has the upper and lower bases **301** and **302** stacked vertically, and that each of the upper and lower bases **301** and **302** has one row of five second terminal slots **33**. Each of the rows of second terminal slots **33** extend to a contact interface substrate **76** and form one row of elastic movement spaces **762** separately arranged and depressed into the insulating layer **761**. The insulating layer **761** has a bottom surface **763** on the one row of depressed elastic movement spaces **762** and is separated from the metal housing **60**. The two rows of second terminals **50** are assembled into the two rows of second terminal slots **33**, respectively. The two rows of first terminals **40** are embedded into, injected molded with and fixed to the upper and lower bases **301** and **302**. In addition, a transversally extending metal partition plate **87**, for separating the two rows of second terminals **50** to reduce the mutual electric interference and facilitate the high-speed transmission, is provided between the upper and lower bases **301** and **302**.

Referring to FIG. **20**, the second terminal **50** sequentially has, from one end to the other end, a pin **51**, a fixing portion (also referred to as a first fixing portion) **52** and an extension **53**. The fixing portion **52** is fixed to the second terminal slot **33**. The extension **53** connected to the front end of the fixing portion **52** extends to the contact interface substrate **76** and has a distal segment bent inversely to form a contact **54**. The contact **54** is the cut section of the distal end of the extension **53**. The extension **53** is vertically elastically movable in the elastic movement spaces **762**. The contact **54** is vertically elastically movable and projects beyond the inner surface of the contact interface substrate **76**. The pin **51** is connected to the other end of the fixing portion **52**, projects beyond the rear end of the insulating base **30** and has a distal segment formed with a wiring portion **511**. The contacts **44** of the two rows of first terminals **40** and the contacts **54** of the two rows of second terminals **50** respectively form the USB 3.0 contact interfaces **1***b* of the two contact interface substrates **76**, respectively. The two USB 3.0 contact interfaces **1***b* have the same contact interface and the connection points with the circuit serial numbers arranged reversely. As shown in FIG. **18**, the contacts **44** of the upper one row of first terminals have the connection points with the circuit serial numbers of 1, 2, 3, 4 arranged from left to right, the contacts **54** of one row of second terminals have the connection points with the circuit serial numbers of 9, 8, 7, 6, 5 arranged from left to right, the contacts **44** of the lower one row of first terminals have the connection points with the circuit serial numbers of 4, 3, 2, 1 arranged from left to right, and the contacts **54** of one row of second terminals have the connection points with the circuit serial numbers of 5, 6, 7, 8, 9 arranged from left to right.

Referring to FIGS. **17** to **20**, the two contact interface substrates **76** are formed with the contacts **44** of the front row of the first terminals **40** and the contacts **54** of the rear row of the second terminals **50**, wherein the width of each of the front row of contacts **44** is wider than the width of each of the rear row of contacts **54**, the number of the front row of contacts **44** is equal to 4, which is smaller than the number the rear row of contacts **54**, which is equal to 5. The arrangement width of the front row of contacts **44** is narrower than the arrangement width of the rear row of contacts **54**. The insulating layers **761** of the two contact interface substrates have the transversal front-rear isolating regions **764** for separating the front and rear rows of contacts **44** and **54** from each other.

The two contact interface substrates **76** have separating structures corresponding to the rear row of contacts, so that the rear row of contacts **54** cannot touch the metal housing **60** when being vertically elastically moved. The separating structures are the elastic movement space **762** and the bottom surface **763**.

The front row of contacts **44** is connected to a fixing portion (also referred to as a second fixing portion) **42** extending to and being positioned at the contact interface substrate **76**. The fixing portions **52** of the second terminals **50** of the rear row of contacts **54** extend to and are positioned at the insulating base **30**.

The rear row of contacts **54** of the two contact interface substrates are closer to the middle height of the fitting space **77** than the front row of contacts **44**, so that the two rows of contacts **44** and **54** are in the front-low and rear-high manner.

According to the USB 3.0 contact interface specified by USB Association, the front row of contacts **44** have the connection point with the circuit serial number 1 being the ground contact, the connection point with the circuit serial number 4 being the power contact, and the connection points

with the circuit serial numbers 3 and 2 being one pair of signal contacts represented by D+ and D−, respectively; and the rear row of contacts **54** have the connection point with the circuit serial number 7 being the ground contact, and the connection points with the circuit serial numbers 6 and 5, and 9 and 8 being two pairs of signal contacts represented by RX+ and RX−, and TX+ and TX−, respectively.

The front row of contacts **44** are connected to a fixing portion **42** extending to and being positioned at the contact interface substrate **76**. The fixing portions **52** of the second terminals **50** of the rear row of contacts **54** extend to and are positioned at the insulating base **30**.

Referring to FIG. **21**, the middle terminal of each row of second terminals **50** is the ground terminal, and one pair of signal terminals are disposed on two sides of the middle terminal. Each pair of signal terminals can be designed to be close to each other, and this is advantageous to the high-speed transmission, so the fixing portions **52** and the pins **51** of the two second terminals **50** on the two sides are close to each other.

Referring to FIG. **22**, the rear plug **70** is a three-piece combination comprising an upper portion **72**, a middle portion **71** and a lower portion **73**, so that the pins **41** of the two rows of first terminals **40** and the pins **51** of the two rows of second terminals **50** pass through and closely fit with the rear plug **70**. The rear plug **70** mainly plugs into the voids communicating the two rows of second terminal slots **33** with the rear end of the insulating base **30**.

Referring to FIG. **23**, with the above-mentioned structure, the heights of the two contact interface substrates **76** of the fitting portion **75** can be fit into the small space **161** of the connection slot **16** of the A-type standard USB 3.0 electrical connection socket **11**. So, the A-type standard USB 3.0 electrical connection socket **11** and the A-type standard USB 2.0 electrical connection socket **10** have substantially the same structure except that only one row of five second terminals **15** are added. The second terminal **15** has an elastically non-movable contact **151** disposed in front of the contact **141** of the first terminal **14**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **16** of the A-type standard USB 3.0 electrical connection socket **11**, and one of the USB 3.0 contact interfaces **1***b* (contacts **44** and **54**) of the two contact interface substrates **76** is electrically connected to the USB 3.0 contact interface **2***b* (contacts **141** and **151**) below the tongue **121** of the A-type standard USB 3.0 electrical connection socket **11**.

Regarding the wiring portions **411** of the pins of the two rows of first terminals **40** of this embodiment, the connection points with the same circuit serial number are connected to the same wire **85**. Regarding the wiring portions **511** of the pins of the two rows of second terminals **50**, the connection points with the same circuit serial number are connected to the same wire **85**. So, the connection cable **86** has one set of nine wires **85** thereinside.

Referring to FIG. **24** of this embodiment, each of the wiring portions **411** of the pins of the two rows of first terminals **40** and the wiring portions **511** of the pins of the two rows of second terminals **50** is connected to a wire **85**. So, the connection cable **86** has two set of nine wires **85** (18 wires **85** in total).

Referring to FIG. **25**, another modification of the bidirectional duplex USB 3.0 electrical connection plug of this embodiment is provided with the difference that a transversally extending metal partition plate **88** is added to each of the upper and lower bases **301** and **302** of the insulating base **30**, so that the mutual electric interference of one row of first and second terminals **40** and **50** is reduced, and this is more advantageous to the high-speed transmission.

Referring to FIGS. **26** and **27**, a bidirectional simplex USB 3.0 electrical connection socket **902** of this embodiment is almost the same as the USB 2.0 bidirectional duplex electrical connection socket **901** of the first embodiment except for the difference that one row of five second terminals **95** are further provided. The second terminal **95** has an elastically non-movable contact **954** disposed in front of the contact **944** of the first terminal **94**. The contact **954** is slightly depressed into the bottom side of the tongue **921**. The one row of contacts **944** and the one row of contacts **954** form the USB 3.0 contact interface **2***b*.

The heights of the two contact interface substrates **76** of the fitting portion **75** of the bidirectional duplex USB 3.0 electrical connection plug **103** can be fit into the spaces on the upper and lower connection surfaces of the tongue **921** of the connection slot **96**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the bidirectional simplex USB 3.0 electrical connection socket **902**, and one of the USB 3.0 contact interfaces **1***b* (contacts **44** and **54**) of the two contact interface substrates **76** is electrically connected to the USB 3.0 contact interface **2***b* (contacts **944** and **954**) of the bottom side of the tongue **921** of the bidirectional simplex USB.0 electrical connection socket **902**. In addition, the fitting portion **75** of the bidirectional duplex USB 3.0 electrical connection plug **103** and the connection slot **96** of the bidirectional simplex USB 3.0 electrical connection socket **902** can achieve the better fitting. So, this is different from FIG. **23**, in which a too large space is still left when the contact interface substrate **76** is in the large space **162**.

The USB 3.0 contact interface **2***b* of the bidirectional simplex USB 3.0 electrical connection socket **902** is electrically connected to the USB 3.0 contact interface **1***b* of the bidirectional duplex USB 3.0 electrical connection plug **103** shown in FIG. **19**. So, the front row of elastically non-movable contacts **954** of the socket also comprise two pairs of USB 3.0 signal contacts of RX+, RX−; and TX+, TX−, respectively, and the rear row of elastically movable contacts **944** also comprise one pair of USB 3.0 signal contacts of D+, D−.

The contact interface of at least one connection surface of the two connection surfaces of the tongue **921** has the five elastically non-movable contacts **954** in flat surface contact with the tongue. Only two pairs of elastically non-movable USB 3.0 signal contacts **954** in flat surface contact with the tongue of only one connection surface of the two connection surfaces are electrically connected to only two pairs of USB 3.0 signal contacts **54** of one side of the bidirectional electrical connection plug. The only two pairs of USB 3.0 signal contacts are shown in FIG. **19** as RX+, RX−; and TX+, TX−, respectively.

The contact interface of at least one connection surface of the two connection surfaces of the tongue **921** has at least nine contacts having connection points with the circuit serial numbers arranged in order. Only three pairs of USB 3.0 signal contacts of only one connection surface of the two connection surfaces are electrically connected to only three pairs of USB 3.0 signal contacts of one side of the bidirectional electrical connection plug. The only three pairs of USB 3.0 signal contacts as shown in FIG. **19** as D+, D−; RX+, RX−; and TX+, TX−, respectively.

Referring to FIGS. **28** and **29**, a bidirectional duplex USB 3.0 electrical connection socket **903** and a bidirectional simplex USB 3.0 electrical connection plug **107** of this embodiment are correspondingly connected to each other,

wherein the bidirectional duplex USB 3.0 electrical connection socket **903** is almost the same as the above-mentioned bidirectional simplex USB 3.0 electrical connection socket **902** except for the differences that the socket **903** further additionally comprises one row of first terminals **94** and one row of second terminals **95**, that the top side of the tongue **921** is also formed with a USB 3.0 contact interface **2***b*, that the two connection surfaces of the tongue **921** have inner segments and outer segments lower than the inner segments to have an inverse T shape, that each of the upper and lower connection surfaces of the tongue has an inner section formed with an inner section surface **9211** and an outer section formed with a an outer section surface **9212**, the inner section surface **9211** being a distance away from the plane of the outer section surface **9212**, such that the two sides of the tongue **921** are formed with connection surfaces with steps, and that the contacts **954** of the one row of second terminals **95** of the two USB 3.0 contact interfaces **2***b* are in flat surface contact with and positioned at the outer section surfaces **9212** of the outer segments of the two connection surfaces of the tongue **921**, and are not vertically elastically movable. The contacts **944** of the one row of first terminals **94** of the two USB 3.0 contact interfaces **2***b* respectively project beyond the inner section surface **9211** of the inner sections of the two connection surfaces of the tongue **921**. The USB 3.0 contact interfaces **2***b* of the top and bottom sides of the tongue **921** have the same contact interface, and the connection points with the circuit serial numbers arranged reversely. The bidirectional simplex USB 3.0 electrical connection plug **107** is almost the same as the above-mentioned bidirectional duplex USB 3.0 electrical connection plug **103** except for the differences that only one of the two contact interface substrates **76** of the fitting portion **75** has the USB 3.0 contact interface **1***b*. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the USB 3.0 bidirectional duplex electrical connection socket **903**, and the USB 3.0 contact interface **1***b* (contacts **44** and **54**) of the contact interface substrate **76** is inevitably electrically connected to the USB 3.0 contact interface **2***b* (contacts **944** and **954**) of one of the top and bottom sides of the tongue **921** of the bidirectional duplex USB 3.0 electrical connection socket **903**.

Only one of the two contact interface substrates **76** of the fitting portion **75** of the bidirectional simplex USB 3.0 electrical connection plug **107** has the USB 3.0 contact interface, and similarly has only three pairs of signal contacts D+, D−; RX+, RX−; and TX+, TX−, as shown in FIG. **19**. The rear row of elastically movable contacts have only two pairs of signal contacts RX+, RX−; and TX+, TX−, and each of the front and rear rows of contacts **44**, **54** has a ground contact, and represent two rows of horizontal pins **41**, **51**, which do not flush with each other.

The USB 3.0 contact interface of the two connection surfaces of the tongue **921** of the bidirectional duplex USB 3.0 electrical connection socket **903** is correspondingly electrically connected to the USB 3.0 contact interface of the bidirectional simplex USB 3.0 electrical connection plug **107**. So, the USB 3.0 contact interface of the two connection surfaces of the tongue **921** similarly has three pairs of signal contacts represented as D+, D−; RX+, RX−; and TX+, TX−, respectively. Each of the front and rear rows of contacts **944**, **954** has a ground contact. So, the two connection surfaces of the tongue **921** form high and low contacts and high and low ground contacts.

Referring to FIG. **30**, the bidirectional duplex USB 3.0 electrical connection socket **903** and the bidirectional duplex USB 3.0 electrical connection plug **103** are correspondingly connected together, so that the two USB 3.0 contact interfaces **1***b* and **2***b* of the plug and the socket can be bidirectionally connected together to achieve the effect of the convenient use and the doubled transmission speed.

The socket of this embodiment may be designed such that the spaces of the connection slot **96** on the upper and lower connection surfaces of the tongue **921** may have the same height or different heights, wherein the height may range between 0.55 mm and 1.5 mm, and the height of the connection slot **96** may be designed to range between 3 mm and 4.9 mm. Thus, the height of the contact interface substrate matching with the inserted bidirectional USB 2.0 electrical connection plug ranges between 0.5 mm and 1.45 mm, and the height of the fitting portion ranges between 3 mm and 4.85 mm.

Referring to FIGS. **31** and **32**, another modification of the bidirectional duplex USB 3.0 electrical connection plug of this embodiment is provided, wherein the insulating base **30** thereof similarly has the vertically stacked upper and lower bases **301**, **302**, except for the difference that the inner surfaces of the two contact interface substrates **76** are projectingly formed with two rows of vertically elastically movable contacts. That is, the two rows of first terminals **40** are prodded from the plate surface of the extension **43** to the fitting space **77** to form a projecting reverse extending sheet **45**. The reverse extending sheet **45** is vertically elastically movable and has the contact **44**. The two rows of second terminals **50** are prodded from the plate surface of the extension **53** to the fitting space **77** to form a projecting reverse extending sheet **55**. The reverse extending sheet **55** is vertically elastically movable and has a cut section of a distal end formed with the contact **54**. The contacts **44** and **54** are elastically movable and much more projecting beyond the contact interface substrate than the contact of the A-type standard electrical connection plug by about 0.4 mm to 0.7 mm. So, the height of the fitting space **77** may be designed to be larger and range between about 2.35 mm and 2.7 mm, which is larger than the height (1.95 mm) of the fitting slot **24** of the conventional A-type standard USB 2.0 electrical connection plug **20**. In this embodiment, the projecting distance of 0.6 mm is designed, the height of the fitting space **77** is 2.6 mm, and the height of the fitting portion **75** can reach 4.0 mm. Referring to FIG. **33**, when the fitting portion **75** is fit into the connection slot **16** of the A-type standard USB 3.0 electrical connection socket **11**, the contacts **44** and **54** still can be electrically connected to the contacts **141** and **151** by way of elastic movement. However, the remaining space of the large space of the contact interface substrate **76** in the connection slot **16** can be reduced to be about 1.12 mm. Thus, the space provided when the plug is improperly forced to rotate downwards can be shortened to prevent the tongue **121** of the socket from being broken. The front row of contacts **44** are one row of elastically movable contacts bent from an insertion port **77***a* of the fitting space **77** inversely to extend forwardly.

The two contact interface substrates **76** have a separating structure corresponding to the rear row of contacts, so that the rear row of contacts **54** cannot touch the metal housing **60** when being vertically elastically moved. The separating structure is the elastic movement space **762**. The front row of contacts **44** is connected to a fixing portion **42** extending to and being positioned at the contact interface substrate **76**. The fixing portions **52** of the terminals **50** of the rear row of contacts **54** extend to and are positioned at the insulating base **30**.

Each of the pins **41**, **51** of the terminals **40**, **50** of the two contact interfaces forms one row of horizontal pins to constitute two rows of horizontal pins arranged vertically.

Referring to FIGS. **34** to **44**, the third embodiment of the invention provides a bidirectional MICRO USB electrical connection plug and a bidirectional MICRO USB electrical connection socket.

Referring to FIGS. **34** to **37**, a bidirectional duplex MICRO USB electrical connection plug **102** of this embodiment can be bidirectionally correspondingly connected to a standard MICRO USB electrical connection socket **101**, as shown in FIG. **37**. The standard MICRO USB electrical connection socket **101** has an insulating base **12** and a metal housing **13**. The upper portion of the front end of the insulating base **12** has a horizontally frontwardly projecting tongue **121**. The metal housing **13** covers the insulating base **12** and forms a connection slot **16** covering the tongue **121**. The connection slot **16** respectively has the small space **161** and the large space **162** on the top and bottom sides of the tongue **121**. The insulating base **12** has one row of five first terminals **14**. The first terminal **14** has a vertically elastically non-movable contact **141** slightly depressed into the bottom side of the tongue **121**. The contacts **141** of the one row of first terminals **14** form a MICRO USB contact interface **2***c*.

The tongue of the standard MICRO USB (2.0 or 3.0) electrical connection socket specified by USB Association has the height of 0.6 mm, wherein the small space has the height of 0.28 mm, the large space has the height of 0.97 mm, the connection slot has the total height of 1.85 mm, and the contact **141** depressed into the bottom side of the tongue **121** has the height of 0.12 mm. The MICRO USB 2.0 has five elastically non-movable contacts disposed on one tongue. The MICRO USB 3.0 has five elastically non-movable contacts disposed on each of two tongues.

The connection portion of the standard MICRO USB (2.0 or 3.0) electrical connection plug specified by USB Association has the height of 1.8 mm, wherein the fitting slot has the height of 0.65 mm, the metal housing has the thickness of 0.25 mm, and the contact interface substrate has the height of 0.9 mm. Referring to FIGS. **34** to **36**, the bidirectional duplex MICRO USB electrical connection plug **102** of this embodiment comprises an insulating base **30**, two rows of first terminals **40**, a metal housing **60**, a positioning structure **34***a* and a fitting portion **75**.

The insulating base **30** is plastically injection molded and formed by combining the upper base **301** and the lower base **302** together. The front segment of the insulating base **30** has a fitting space **77**. The insulating base **30** forms the top, bottom, left and right sides of the fitting space **77**, wherein the insertion port **77***a* of the fitting space **77** faces frontwards.

The metal housing **60** covers the insulating base **30**, wherein the front-view shape of the metal housing **60** is rectangular, top-bottom symmetrical and left-right symmetrical.

The fitting portion **75** disposed at the front end of the insulating base **30** has two opposite contact interface substrates **76** and a fitting space **77**, the interval of the two contact interface substrates **76** is the fitting space **77**, the inside layers of the two contact interface substrates **76** are integrally formed jointly with the insulating base **30**, and the outside layers of the two contact interface substrates **76** pertain to the metal housing **60**. The fitting space **77** is also the fitting space **77** of the insulating base **30**. Each of the two contact interface substrates **76** has a MICRO USB contact interface **1***c*. The two MICRO USB contact interfaces **1***c* are formed by the two rows of first terminals **40**. The two MICRO USB contact interfaces **1***c* are electrically connected to the insulating base **30**. The two MICRO USB contact interfaces **1***c* have the same contact interface and the connection points with the circuit serial numbers arranged reversely. The external shape of the fitting portion **75** is rectangular, top-bottom symmetrical and left-right symmetrical. The fitting portion **75** can be bidirectionally inserted into the connection slot of the standard MICRO USB electrical connection socket **101**, and the two contact interface substrates **76** can be fit into the small space.

The positioning structure **34***a* is integrally formed jointly with the front segments of two sidewalls **34** of the insulating base **30**. The two sidewalls **34** are integrally connected to the two sides of the insulating layers of the two contact interface substrates **76** to position the insulating layers of the two contact interface substrates **76**. The insulating layers of the inside layers of the two contact interface substrates **76** are the top and bottom sides of the fitting space **77**. The two sidewalls **34** are the left and right sides of the fitting space **77**.

Each row of the two rows of first terminals **40** have five terminals. The two rows of first terminals **40** are embedded, injected and fixed to the upper base **301** and the lower base **302**, respectively. The first terminal **40** sequentially has, from one end to the other end, a pin **41**, a fixing portion **42** and an extension **43**. The fixing portion **42** is fixed to the first terminal slot **31**. The extension **43** connected to the front end of the fixing portion **42** extends to the contact interface substrate **76**. The plate surface of the front segment of the extension **43** is pressed to form the reverse extending sheet **45** projecting toward the fitting space **77**. The reverse extending sheet **45** is vertically elastically movable and has the cut section of the distal end formed with a contact **44**. The contact **44** projects beyond the inner surface of the contact interface substrate **76**. The pin **41** connected to the other end of the fixing portion **42** projects beyond the rear end of the insulating base **30** and has a distal segment formed with the wiring portion **411**. The contacts **44** of the two rows of first terminals **40** respectively form the MICRO USB contact interfaces **1***c* of the two contact interface substrates **76**. The two MICRO USB contact interfaces **1***c* have the same contact interface and have the connection points with the circuit serial numbers arranged reversely, as shown in FIG. **35**, wherein the upper MICRO USB contact interface **1***c* has the connection points with the circuit serial numbers of 1, 2, 3, 4, 5 arranged from left to right, and the lower MICRO USB contact interface **1***c* has the connection points with the circuit serial numbers of 5, 4, 3, 2, 1 arranged from left to right.

The biased MICRO USB electrical connection socket **101**, into which the plug of this embodiment is inserted and connected, has only one tongue, and thus pertains to the MICRO USB 2.0. So, similar to the USB 2.0 contact interface **1***a*, the MICRO USB contact interfaces **1***c* of the two contact interface substrates **76** also have one pair of USB 2.0 signal contacts D+, D−.

According to the MICRO USB 2.0 contact interface specified by the USB Association, the connection point with the circuit serial number 1 is the power contact, the connection points with the circuit serial numbers 3, 2 are one pair of signal contacts respectively labeled as D+, D−, the connection point with the circuit serial number 4 is the control contact, and the connection point with the circuit serial number 5 is the ground contact.

In addition, as shown in FIG. **36**, the contacts **44** of the one row of first terminals **40** have the connection points with the circuit serial numbers 1 and 5 closer to the front end, and

the connection points with the circuit serial numbers 2, 3, 4 closer to the rear end. In addition, as shown in FIG. **35**, the contacts **44** of the two rows of first terminals **40** are staggered in the left-to-right direction so that they cannot touch each other.

This embodiment serves as a connector of a connection cable, wherein a housing **80** is formed by way of glue pouring or the housing **80** is formed by assembling and injection molding upper and lower housings together. The wiring portions **411** of the pins of the two rows of first terminals **40** are the connection points with the same circuit serial number connected to the same wire **85**. Thus, the connection cable **86** has one set of nine wires **85**.

Referring to FIG. **37**, with the above-mentioned structure, the heights of the two contact interface substrates **76** of the fitting portion **75** can be fit into the small space **161** of the connection slot **16** of the standard MICRO USB electrical connection socket **101**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **16** of the standard MICRO USB electrical connection socket **10**, and the MICRO USB contact interface **1***c* (contacts **44**) of one of the two contact interface substrates **76** is electrically connected to the MICRO USB contact interface **2***c* (contacts **141**) below the tongue **121** of the standard MICRO USB electrical connection socket **101**.

The two contact interface substrates **76** of the fitting portion **75** of this embodiment have the same height ranging between about 0.3 mm and 0.36 mm, wherein the fitting space **77** is about 0.65 mm, so the height of the fitting portion **75** ranges between about 1.2 mm and 1.35 mm, is significantly lower than the height (1.8 mm) of the connection portion of the standard MICRO USB electrical connection plug, and is higher than the height (0.97 mm) of the large space **162** of the connection slot **16** of the standard MICRO USB electrical connection socket **101**. So, the fitting portion **75** cannot be incorrectly inserted into the large space **162** upon use. However, the height of the contact interface substrate **76** may be designed to range between 0.23 mm and 0.4 mm, and the height of the fitting portion **75** may be designed to range between 1.1 mm and 1.45 mm.

In order to facilitate the manufacturing, if the height of the contact interface substrate **76** is designed to be greater than the height (0.28 mm) of the small space **161**, it still can be used because the tight insertion can be performed by the plastic resilience of the tongue **921**.

Referring to FIGS. **38** and **39**, a bidirectional simplex MICRO USB electrical connection socket **904** of this embodiment comprises an insulating base **92**, a metal housing **93** and one row of first terminals **94**.

The insulating base **92** is plastically injection molded and has a middle of a front end projectingly formed with a horizontally extending tongue **921**. The bottom side of the tongue **921** has a MICRO USB contact interface **2***c*. The MICRO USB contact interface **2***c* is formed by the one row of first terminals **94**. The MICRO USB contact interface **2***c* is electrically connected to the rear end of the insulating base **30**.

The metal housing **93** covers the insulating base **92** and the tongue **921** to form a connection slot **96** at the front end of the insulating base **92**. The tongue **921** is disposed at a middle height of the connection slot **96**. Symmetrical spaces are formed on the top and bottom sides of the tongue **921**. The external shape of the connection slot **96** is rectangular, top-bottom symmetrical and left-right symmetrical.

The one row of first terminals **94** is assembled with the insulating base. Each terminal has a pin **941**, a fixing portion **942** and an extension **943**. The fixing portion **942** is fixed to the insulating base **92**. The extension **943** connected to the front end of the fixing portion **942** extends to the tongue **921** and has a contact **944**. The contact **944** slightly depressed into the bottom side of the tongue **921** is not vertically elastically movable. The pin **941** connected to the rear end of the fixing portion **942** projects beyond the insulating base **92**. The contacts **944** of the one row of first terminals **94** form the MICRO USB contact interface **2***c*.

This embodiment is characterized in that the heights of the spaces of the connection slot **96** on the upper and lower connection surfaces of the tongue **921** are about 0.3 mm to 0.5 mm, and are smaller than the large space **162** of the standard MICRO USB electrical connection socket **101**, while the height of the tongue **921** is kept unchanged. The height of the connection slot **96** is about 1.2 mm to 1.6 mm. A fitting portion of an electrical connection plug can be bidirectionally inserted into the connection slot **96**.

This embodiment may be designed such that the spaces of the connection slot **96** on the upper and lower connection surfaces of the tongue **921** may have the same height or different heights, wherein the height may range between 0.23 mm and 0.8 mm, and the height of the connection slot **96** may be designed to range between 1.06 mm and 2.2 mm. Thus, the height of the contact interface substrate matching with the inserted and connected bidirectional MICRO USB electrical connection plug ranges between 0.23 mm and 0.7 mm, and the height of the fitting portion ranges between 1.1 mm and 2.05 mm.

Referring to FIG. **40**, with the above-mentioned structure, the heights of the two contact interface substrates **76** of the fitting portion **75** of the bidirectional duplex MICRO USB electrical connection plug **102** can be fit into the spaces on the upper and lower connection surfaces of the tongue **921** of the connection slot **96**. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the bidirectional simplex MICRO USB electrical connection socket **904**, and the MICRO USB contact interface **1***c* (contacts **44**) of one of the two contact interface substrates **76** is electrically connected to the MICRO USB contact interface **2***c* (contacts **944**) of the bottom side of the tongue **921** of the bidirectional simplex MICRO USB electrical connection socket **904**. In addition, the fitting portion **75** of a bidirectional duplex MICRO USB electrical connection plug **108** and the connection slot **96** of the bidirectional simplex MICRO USB electrical connection socket **904** can achieve the better fitting. So, this is different from FIG. **37**, in which a too large space is still left when the contact interface substrate **76** is in the large space **162**.

Referring to FIGS. **41** and **42**, a MICRO USB bidirectional duplex electrical connection socket **905** of this embodiment is almost the same as the bidirectional simplex MICRO USB electrical connection socket **904** except for the differences that the socket **905** further additionally has one row of first terminals **94**, and that the top side of the tongue **921** is also formed with a MICRO USB contact interface **2***c*. The MICRO USB contact interfaces **2***c* of the top and bottom sides of the tongue **921** have the same contact interface and the connection points with the circuit serial numbers arranged reversely. The pins **941** of the two rows of first terminals **94** are arranged in a front row and a rear row, and the two rows of pins **941** have horizontal distal ends.

Referring to FIG. **43**, a bidirectional simplex MICRO USB electrical connection plug **109** is inserted and connected to the MICRO USB bidirectional duplex electrical connection socket **905**, wherein the bidirectional simplex MICRO USB electrical connection plug **109** is almost the same as the bidirectional duplex MICRO USB electrical

connection plug **102** except for the difference that only one of the two contact interface substrates **76** of the fitting portion **75** has the MICRO USB contact interface **1***c*. So, the fitting portion **75** can be bidirectionally inserted into the connection slot **96** of the bidirectional duplex MICRO USB electrical connection socket **905**, and the MICRO USB contact interface **1***c* (contacts **44**) of the contact interface substrate **76** is inevitably electrically connected to the MICRO USB contact interface **2***c* (contacts **944**) of one of the top and bottom sides of the tongue **921** of the bidirectional duplex MICRO USB electrical connection socket **905**.

Five contacts **44** having the connection points with the circuit serial numbers arranged in order of only one of the two contact interface substrates **76** of the bidirectional simplex MICRO USB electrical connection plug **109** have only one pair of USB 2.0 signal contacts D+, D−.

Referring to FIG. **44**, the bidirectional duplex MICRO USB electrical connection plug **102** is inserted and connected to the MICRO USB bidirectional duplex electrical connection socket **905**, wherein each of the wiring portions **411** of the pins **41** of the two rows of first terminals **40** is connected to a wire **85**, so that the connection cable **86** has two sets of five wires **85** (10 wires in total) thereinside. Thus, the two MICRO USB contact interfaces **1***c* and **2***c* of the plug and the socket can be bidirectionally connected together to achieve the effects of the convenient use and the doubled transmission speed.

MICRO USB has the minimum height specification currently specified by USB Association. The fitting slot of the connection portion of the standard MICRO USB electrical connection plug specified by USB Association has the height of 0.65 mm, wherein the contact interface substrate has the height of 0.9 mm; and the small space of the standard MICRO USB electrical connection socket is 0.97 mm, and the tongue thickness is 0.6 mm.

In the design according to the technical characteristics of the invention, the heights of the two contact interface substrates are smaller than 0.9 mm and the fitting space is 0.65 mm. So, the total height of the fitting portion of the plug of the invention may be smaller than 0.9 mm×2+0.65 mm=2.45 mm. The total height of the connection slot of the socket of the invention may be smaller than 0.97 mm×2+0.6 mm=2.54 mm.

Referring to FIG. **45**, a bidirectional duplex USB 3.0 electrical connection plug according to the fourth embodiment of the invention is almost the same as the second embodiment except for the difference that the insulating base **30** only forms the top and bottom sides of the fitting space **77** and does not integrally form the left and right sides. Each of the left and right sides of the metal housing **60** has at least one inwardly projecting projection **66** to form the left and right sides of the fitting space **77**, wherein the at least two projections **66** function as a positioning structure resting and positioning the insulating layers of the two contact interface substrates **76** without approaching each other.

Referring to FIG. **46**, the fifth embodiment of the invention is almost the same as the fourth embodiment except for the differences that the positioning structure has openings **613** on the top and bottom sides of the front segment of the metal housing **60**, and that the front segment of the insulating base **30** is hot-molten and combined with the openings **613**, so that the insulating layer of the inside layer and the metal housing of the outside layer of the two contact interface substrates **76** are combined and fixed together.

Referring to FIG. **47**, the sixth embodiment of the invention is almost the same as the fifth embodiment except for the difference that the positioning structure has an adhesive **325** between the insulating layer of the inside layer and the metal housing of the outside layer of the two contact interface substrates **76** to combine and fix them together.

The tongue of the standard MINI USB electrical connection socket specified by USB Association has the height of 1.6 mm, wherein the small space has the height of 0.45 mm, the large space **162** has the height of 1.05 mm, and the connection slot **16** has the height of 3.1 mm. The contact interface substrate **25** of the standard MINI USB electrical connection plug **201** specified by USB Association has the height of 0.9 mm, wherein the fitting slot **24** has the height of 1.8 mm, the metal housing **21** has the thickness of 0.3 mm, and the total height is 3 mm.

The invention may also be applied to a bidirectional duplex MINI USB electrical connection plug, which may be bidirectionally correspondingly connected to a standard MINI USB electrical connection socket, wherein each of the two contact interface substrates has a MINI USB contact interface, the MINI USB contact interface comprises elastically non-movable contacts of one row of five terminals, the heights of the two contact interface substrates of the fitting portion are the same and equal to about 0.4 mm, and the fitting space is about 1.8 mm. So, the height of the fitting portion is about 2.6 mm, which is significantly lower than the height (3 mm) of the connection portion of the standard MINI USB electrical connection plug. However, the height of the contact interface substrate **76** may be designed to range between 0.35 mm and 0.5 mm, and the height of the fitting portion **75** may range between 2.5 mm and 2.8 mm.

In addition, in order to facilitate the manufacturing, the height of the contact interface substrate of the bidirectional duplex MINI USB electrical connection plug may range between 0.35 mm and 0.9 mm, the height of the fitting portion may range between 2.5 mm and 3.6 mm, and the connection slot of the matched MINI USB electrical connection socket forms symmetrical spaces on two opposite sides of the tongue. The height of the symmetrical space may range between 0.4 mm and 0.95 mm, and the connection slot has the height ranging between 2.45 mm and 3.65 mm.

At present, the standard electrical connection sockets with the biased tongues specified by USB Association comprise the above-mentioned A-type, MICRO and MINI. The design of the invention can be bidirectionally inserted into and connected to the three standard electrical connection sockets.

Referring to FIGS. **48** and **48**A, the seventh embodiment of the invention is an adapter cable, which has one end connected to a bidirectional duplex USB 2.0 electrical connection plug **100**, and the other end connected to an APPLE bidirectional duplex electrical connection plug **106**. The bidirectional duplex USB 2.0 electrical connection plug **100** is the same as the first embodiment. The APPLE bidirectional duplex electrical connection plug **106** is a plate-sheet like connector, wherein each of two sides of the plate sheet thereof has a contact interface having one row of eight elastically non-movable connection points.

Referring to FIGS. **49** and **49**A, the eighth embodiment of the invention is an adapter cable, which has one end connected to a bidirectional duplex USB 3.0 electrical connection plug **103**, and the other end connected to an APPLE bidirectional duplex electrical connection plug **106**, wherein the bidirectional duplex USB 2.0 electrical connection plug **103** is the same as the second embodiment.

Referring to FIGS. **50** and **50**A, the ninth embodiment of the invention is an adapter cable, which has one end connected to a bidirectional duplex MICRO USB electrical connection plug **102**, and the other end connected to an

APPLE bidirectional duplex electrical connection plug **106**, wherein the bidirectional duplex USB 2.0 electrical connection plug **102** is the same as the third embodiment.

Referring to FIGS. **51** and **51**A, the tenth embodiment of the invention is an adapter cable, which has one end connected to a bidirectional duplex USB 2.0 electrical connection plug **100**, and the other end connected to a bidirectional duplex MICRO USB 2.0 electrical connection plug **102**.

Referring to FIGS. **52** to **57**, the eleventh embodiment of the invention provides a bidirectional MICRO USB electrical connection plug and a bidirectional MICRO USB electrical connection socket.

Referring to FIGS. **52** to **54**, a bidirectional duplex MICRO USB electrical connection plug **120** and a correspondingly connected standard MICRO USB electrical connection socket **111** of this embodiment are almost the same as the third embodiment except for the differences that the contact **44** of the bidirectional duplex MICRO USB electrical connection plug **120** is elastically non-movable, and that the contact **141** of the standard MICRO USB electrical connection socket **111** is vertically elastically movable.

Referring to FIGS. **55** to **57**, the bidirectional duplex MICRO USB electrical connection plug **120** and a bidirectional simplex MICRO USB electrical connection socket **112** are provided, wherein the tongue **121** of the bidirectional simplex MICRO USB electrical connection socket **112** is disposed at the middle height of the connection slot **16**, and symmetrical spaces are formed on the top and bottom sides of the tongue **121**.

Referring to FIGS. **58** to **63**, the twelfth embodiment of the invention provides a bidirectional low-height electrical connection plug and a bidirectional low-height electrical connection socket.

Referring to FIGS. **58** to **60**, a bidirectional duplex low-height electrical connection plug **123** and a bidirectional simplex low-height electrical connection socket **113** are provided and almost the same as the eleventh embodiment except for the difference that this embodiment has the middle size design. That is, the height of the contact interface substrate **76** of the bidirectional duplex low-height electrical connection plug **123** ranges between 0.3 mm and 0.9 mm, wherein the fitting space **77** ranges between about 0.7 mm and 0.8 mm, and the total height ranges between about 1.3 mm and 2.5 mm. The height of the tongue **121** of the bidirectional simplex low-height electrical connection socket **112** ranges between about 0.65 mm and 0.75 mm. The heights of the two symmetrical spaces on the top and bottom sides of the tongue **121** range between 0.35 mm and 0.95 mm, and the height of the connection slot **16** ranges between 1.35 mm and 2.65 mm, so that the connector can be easily manufactured and become slim and light.

The height of the contact interface substrate **76** of the bidirectional duplex low-height electrical connection plug **123** of this embodiment is about 0.55 mm, the fitting space **77** is about 0.7 mm, the total height is about 1.8 mm, and the height of the tongue **121** of the bidirectional simplex low-height electrical connection socket **113** is about 0.65 mm. The heights of the two symmetrical spaces on the top and bottom sides of the tongue **121** are about 0.6 mm, and the height of the connection slot **16** is about 1.85 mm.

Referring to FIGS. **61** and **62**, a bidirectional simplex low-height electrical connection plug **124** and a bidirectional duplex low-height electrical connection socket (also referred to as an adapted connector) **114** are provided, wherein the bidirectional simplex low-height electrical connection plug **124** only has one row of first terminals **40**. So, only one contact interface substrate **76** has one row of contacts **44**, and the bidirectional duplex low-height electrical connection socket **114** has two rows of first terminals **14**. The insulating base **12** has a base **122** and a tongue **121**. The front end of the base **122** is projectingly formed with the tongue **121**. The thickness of the base **122** is larger than that of the tongue **121**. Each of the top and bottom sides of the tongue **121** is provided with one row of contacts **141** of terminals, and the insulating base **12** is formed by stacking the upper base **125** and the lower base **126**. The upper and lower bases **125** and **126** are embedded and injection molded with the one row of first terminals **14**.

Each first terminal is integrally provided with a pin **144**, a fixing portion **142** and an extension **143**. The fixing portion **142** is fixed to the insulating base **12**. The extension **143** is connected to the front end of the fixing portion **142**, extends to the tongue **121** and has a contact **141**. The contact **141** projects beyond the bottom surface of the tongue **121** and is vertically elastically movable. The pin **144** connected to the rear end of the fixing portion **142** and extends out of the insulating base. The contacts **141** of the one row of first terminals **14** form the MICRO USB 2.0 contact interface.

The extension of each first terminal has an inner section **1431**, which is embedded into, injection molded with and fixed to the inner section of the tongue **121**, and an outer section **1432**, which is embedded into, injection molded with and fixed to the outer section of the tongue **121** and exposes the outer sections of the two connection surfaces. The plate surface of the outer section **1432** of the extension is prodded to form the projecting contact **141**.

Referring to FIG. **63**, the bidirectional duplex low-height electrical connection plug **123** and a bidirectional duplex low-height electrical connection socket **114** are correspondingly connected together. The insulating base **12** of the bidirectional duplex low-height electrical connection plug **123** is integrally embedded and injection molded with two rows of first terminals, so that the doubled transmission speed can be achieved. The two contact interfaces **1***d* and **2***d* of the plug and socket have the same contact interface, and the two contact interfaces have the connection points with the circuit serial numbers arranged reversely.

In addition, the contact interface of the low-height electrical connection plug may also be designed to have the vertically elastically movable contacts, and the contact interface of the low-height electrical connection socket is designed to have elastically non-movable contacts.

Referring to FIGS. **64** to **68**, the thirteenth embodiment of the invention provides a bidirectional duplex low-height electrical connection plug **123** and a bidirectional simplex low-height electrical connection socket **113**, and is almost the same as the twelfth embodiment except for the differences that the contact interface of the bidirectional duplex low-height electrical connection plug **123** of this embodiment has seven elastically non-movable contacts **44**, and at least one optical fiber cable **89**. The optical fiber cable **89** has a connection point **891** at the inner end of the fitting space **77**. Each of the left and right sides of the metal housing **60** has an engaging portion **65**. The engaging portion **65** is an engagement hole, and each of the two sidewalls **34** of the insulating base also correspondingly has a slot **305** to provide the larger engaging depth. The contact interface of the low-height electrical connection socket has seven vertically elastically movable contacts **141**, and at least one optical fiber cable. The optical fiber cable has a connection point **896** at the front end of the tongue **121** to match with the connection point **891** of the electrical connection plug. Each of the left and right sides of the metal housing **13** has an inwardly projecting engaging portion **18**. The engaging

portion **18** is a resilient fastener. The engaging portion **18** can engage with the engaging portion **65** of the plug to prevent the plug from detaching in a direction opposite to the docking direction. Because the engaging portion **18** engages with the engaging portion **65** by the larger depth, the engaging snap or hand feeling is provided when the plug is inserted into the socket.

Multiple portions of the metal housing **13** perpendicularly corresponding to two connection surfaces of the tongue **121** of the socket are respectively hole-free structures (structures without holes or openings). In the above-mentioned socket, each of two connection surfaces of the tongue **121** may also be provided with a contact interface to form a bidirectional duplex electrical connection socket.

Referring to FIGS. **69** and **69**A, the 14^{th} embodiment of the invention is an adapter cable, which has one end connected to a bidirectional duplex USB 2.0 electrical connection plug **100**, and the other end is adapted into two bidirectional duplex MICRO USB electrical connection plugs **102**.

Referring to FIGS. **70** to **73**, the 15^{th} embodiment of the invention is an adapter having a circuit board as a transmission medium. The adapter has a housing **80**. A circuit board **200** is disposed inside the housing **80**. At least one connection point switching device **250** is disposed on the circuit board **200**. The adapter has one end having a bidirectional duplex USB 3.0 electrical connection plug **103**, and the other end having a middle-size bidirectional duplex low-height electrical connection socket **114**. The structures of two rows of terminals **14**, the metal housing **13** and the insulating base thereof are substantially the same as those of the socket of FIG. **41**. Each of the top and bottom sides of the tongue **121** has nine elastically non-movable contacts **141** in flat surface contact with the tongue, and the nine elastically non-movable contacts **141** correspond to nine circuit connection points of the bidirectional duplex USB 3.0 electrical connection plug **103**, wherein two long ones and seven short ones are arranged into two rows of elastically non-movable contacts **141**. In addition, two longer contacts **141** are respectively arranged on two outer sides of the connection surface of the tongue **121**. The structures of the two rows of terminals **14**, the metal housing **13** and the insulating base **12** are substantially the same as those of the socket of FIG. **41**. So, the upper and lower surfaces of the tongue **121** have nine contacts **141**, which similarly comprise the three pairs of USB 3.0 signal contacts, represented as D+, D−; RX+, RX−; TX+, TX−, respectively. In addition, each of left and right sides of the metal housing **13** has an engaging portion **18**, which is an engagement hole (see FIG. **72**). The bidirectional duplex USB 3.0 electrical connection plug **103** and the bidirectional duplex low-height electrical connection socket **114** are electrically connected to the circuit board **200**, and perform the connection point integration and switching through the connection point switching device **250**.

In addition, the adapter cable of each of the ninth, tenth and fourteenth embodiments also has the connection point switching integrated device to perform the connection point integration and switching between different contact interfaces.

In addition, either the adapter cable or the adapter, the bidirectional electrical connectors on two ends thereof may be sockets or plugs, may have a single contact interface or a dual contact interface, wherein both the contact interfaces have some elastically non-movable contacts or all elastically non-movable contacts.

The above-mentioned various embodiments are almost applied to the insertion and connection plugs of the connection cable or the adapter cable. However, the invention still can be applied to many other electronic devices, such as the insertion and connection plugs of a mobile disk, a wireless transceiver, an electrical adapter connector, an IC controller, an electric home apparatus and the like.

In addition, because the bidirectional duplex plug or socket of the invention has two contact interfaces, it may also be used in conjunction with a Schottky diode to provide the circuit safety protection of anti-sort-circuit or anti-backflow. However, the circuit safety protection effect may also be achieved by many ways, such as the provision of the anti-backflow electrical element, the anti-short-circuit electrical element, the circuit safety protection element, or the safety circuit configuration means. Such anti-short-circuit, anti-backflow circuit protection or safety circuit configurations are provided in Chinese Patent Invention Application Serial Numbers 201120320657.8 and 201020547846.4, and detailed descriptions thereof will be omitted.

Referring to FIGS. **74** to **76**, the 16^{th} embodiment of the invention is a bidirectional duplex USB 3.0 electrical connection plug, which is almost the same as the second embodiment except for the differences that the rear segment of the insulating base **30** has a fitting slot **315** for engaging with a circuit board **200**. Each of two sides of the front segment of the circuit board **200** has one row of connection points **206**. One surface of the rear segment has one row of connection points **207**. The two USB 3.0 contact interfaces **1***b* have the same contact interface and the connection points, which have the circuit serial numbers arranged reversely and are electrically connected to the one row of connection points **206**, respectively. The connection points with the same circuit serial number of the two USB 3.0 contact interfaces **1***b* are electrically connected to the same circuit to form one set of circuits to the one row of connection points **207**. One set of nine wires **85** inside a connection cable **86** are electrically connected to the one row of connection points **207**. In addition, a circuit safety protection device **240** is disposed on the circuit board **200**. The circuit safety protection device **240** may have the circuit safety protection means such as the electronic anti-backflow or anti-short-circuit, such as a signal circuit processing control element, an anti-backflow electrical element, an anti-short-circuit electrical element, a Schottky diode, a circuit safety protection element or a safety circuit configuration means. The circuit safety protection device **240** can ensure that the circuit safety protection is possessed, and that the backflow, short-circuit or other poor conditions cannot occur when the two USB 3.0 contact interfaces are cascaded into one set of circuits.

The above-mentioned circuit safety protection device may be similarly applied to the bidirectional electrical connection socket of this invention.

Referring to FIGS. **77** to **85**, the 17^{th} embodiment of the invention provides a bidirectional duplex USB TYPE-C electrical connection socket **1** and a bidirectional duplex USB TYPE-C electrical connection plug **2** correspondingly connected together, and is almost the same as the third embodiment.

Referring to FIGS. **78** to **82**, the bidirectional duplex USB TYPE-C electrical connection plug **2** has an insulating base **30**, two terminal sets, a metal housing **60**, a metal partition plate **630**, a ground shielding member **640**, a circuit board **200** and a rear shielding casing **400**.

The insulating base **30** has a base **310** and a fitting member **320**. The base **310** has an upper base **301** and a

lower base **302** vertically stacked together. The fitting member **320** is fit with the front end of the base. The fitting member **320** has two vertically opposite insulating layers **761** at the same height, and has two side plates **34** connected to the two insulating layers **761** to form an insulating fitting frame body, so that the front end of the fitting member **320** is an insertion port, and the rear end thereof is a fitting port. The opposite surfaces of the two insulating layers **761** are in the form of two connection surfaces **323** with opposite directions. A fitting space **77** is formed between the two connection surfaces **323**. Each of the rear segments of the inner surfaces of two insulating layers **761** has one row of separated separation columns to form one row of slots **322**. The two connection surfaces **323** have the front segments and the rear segments higher than the front segments, so that the height of the front segment of the fitting space **77** is higher than the height of the rear segment of the fitting space **77**. Each of the front ends of the two insulating layers **761** has three openings **328**, and each of the side plates thereof has an opening **329**.

The two terminal sets are embedded, injected and fixed to the upper and lower bases of the insulating base **30**, respectively. The two terminal sets are one row of 12 first terminals **40** and one row of 10 first terminals **40**, respectively. Each first terminal **40** sequentially has, from one end to the other end, a pin **41**, a fixing portion **42** and an extension **43**. The fixing portion **42** is fixed to the base **31**. The extension **43** connected to the front end of the fixing portion **42** extends to a position in front of the base **31**, is covered by the fitting member **320**, and is vertically elastically movable in the slot **322**. The portion near the front end of the extension **43** is curved and projectingly formed with a contact **44**. The contact **44** projects beyond the rear segment of the connection surface **323** to the fitting space **77**. The pin **41** connected to the rear end of the fixing portion **42** projects beyond the rear end of the base. The contacts of the two rows of first terminals **40** having the same circuit serial number are arranged reversely, as shown in FIG. **79**, wherein the contacts **44** of the lower terminal set have the connection points with the circuit serial numbers of 1, 2, 3, . . . , 11, 12 arranged from left to right. The contacts **44** of the upper terminal set have the connection points with the circuit serial numbers of 12, 11, . . . , 3, 2, 1 arranged from left to right. The lower terminal set has 10 terminals, and does not have the terminals having the contacts having the connection points with the circuit serial numbers of 6 and 7.

The metal partition plate **630** is assembled between the upper and lower bases **301** and **302** of the insulating base **30** to separate the two terminal sets from each other. Each of the left and right sides of the metal partition plate **630** integrally extends backwards to form a pin **631**, and integrally extends frontwards to form a resilient fastener **632**. A portion near the front end of the resilient fastener has an engaging projection **633** disposed on the left and right sides of the fitting space **77**. The height of the engaging projection **633** is greater than the material thickness of the metal partition plate **630** and the engaging projection **633** is substantially disposed at the middle height of the fitting space **77**. When the two resilient fasteners **632** elastically move in the left-to-right direction, the openings **329** of the two sides of the fitting member **320** can provide spaces for the two resilient fasteners **632**. The rear end of the resilient fastener **632** has the plate surface vertically connected to the metal partition plate **630**, and the rear segment formed with a bent portion **635** so that the front segment and the rear end form a vertical step, and the middle height of the engaging projection **633** is substantially disposed at the thickness center of the metal partition plate **630**.

The ground shielding member **640** has a four-side closed case and is in a form of a second metal case. The upper and lower plate sheets of the four-side closed case are the two grounding shielding sheets. Each of the front ends of the two grounding shielding sheets is bent inwardly and inversely to form three elastic sheets. Each of the three elastic sheets is bent projectingly to form a contact **643**. The ground shielding member **640** fits with and rests against the outside of the insulating base **30**. The contacts **643** of the two grounding shielding sheets **640** project beyond the front segments of the two connection surfaces **323**, respectively. The contacts **44** of the two terminal sets are exposed from the rear segments of the two connection surfaces **323** and are closer to the middle height of the fitting space **77** than the contacts **643** of the two grounding shielding sheets.

The metal housing **60** covers the insulating base **30** and the ground shielding member **640**. The front segment of the metal housing **60** is in the form of a four-side closed main case **61** covering and shielding the fitting member **320** to form a fitting portion **75**. The shape of the fitting portion **75** can be bidirectionally positioned at a correspondingly connected connector in a duplex manner. The fitting portion **75** comprises two contact interface substrates **76** and the fitting space **77**. The outside layer of the contact interface substrate **76** is the metal housing, and the inside layer thereof is the insulating layer **761**.

The circuit board **200** is a printed circuit board having front and rear ends of top and bottom sides each having one row of connection points **206** with independent circuit connections. The circuit board **200** engages with the rear end of the insulating base **30**. The pins **41** of the two terminal sets are welded to one row of connection points **206** of the front ends of the top and bottom sides, respectively, and the two pins **631** of the metal partition plate **630** are welded to the two connection points **206** of the front end of the top side.

The bidirectional duplex USB TYPE-C electrical connection plug **2** also has the low-height connector design, as shown in FIG. **79**, wherein the height "a" of the two contact interface substrates **76** is about 0.8 mm, the height "b" of the fitting space **77** is about 0.8 mm, and the total height of the fitting portion **75** is about 2.4 mm.

Referring to FIGS. **83** to **85**, a plate-depressed bidirectional duplex USB TYPE-C electrical connection socket **1** of this embodiment has an insulating base **12**, two terminal sets, a ground shielding member **19**, a metal partition plate **17**, a metal housing **13** and a second metal case **132**.

The insulating base **12** is a plastic material, and has a base **122** and a tongue **121**. The front end of the base **122** is projectingly formed with the tongue **121**. The top and bottom sides of the tongue **121** are two connection surfaces having larger plate surfaces. The inner segment of the tongue **121** is thicker than the outer segment and is inverse T shaped, so that the inner segments **1208** of the two connection surfaces project much more than the outer segments **1207** of the two connection surfaces. The insulating base **12** has a first base **125**, a second base **126** and an outer tongue seat **129**. The first and second bases **125** and **126** are vertically stacked, and the outer tongue seat **129** is connected to the outer ends of the first and second bases **125** and **126**.

Each of the two terminal sets includes one row of twelve first terminals **14**. The two terminal sets are embedded and injection molded to the first and second bases **125** and **126**, respectively. Each of the first terminals **14** has one end

extending to form a contact **141** and the other end extending to form a pin **143** projecting beyond the rear end of the base **122**. The contacts **141** of the two terminal sets have first sides exposed from the outer segments **1207** of the two connection surfaces of the tongue **121**, respectively, and second sides embedded into the tongue and fixed in a flat surface contact manner. So, the contacts **141** of the two terminal sets are not elastically movable, the contacts **141** of the two terminal sets have the same contact interface and are aligned in the vertical direction, and the two contact interfaces have the connection points with the circuit serial numbers arranged reversely, as shown in FIG. **84**, wherein the upper row of contacts **141** have the connection points with the circuit serial numbers of 1 to 12 arranged from left to right, and the lower row of contacts **141** have the connection points with the circuit serial numbers of 1 to 12 arranged from right to left. In addition, the contacts **141** of the two terminal sets have two rows of different lengths (i.e., four long ones and eight short ones).

The metal housing **13** covers the insulating base **12**, and rests against and engages with the base **122**. The metal housing **13** has a four-side closed main case **131**, and forms a connection slot **16** in conjunction with the front end of the base **122**. The tongue **121** floats horizontally and is disposed at the middle height of the connection slot **16**. Symmetrical spaces are formed on the two connection surfaces of the tongue **121**. The shape of the connection slot **16** is top-bottom symmetrical and left-right symmetrical.

The second metal case **132** is tightly fit with the outside of the first housing **13**.

The metal partition plate **17** is fixedly disposed between the first and second bases **125** and **126**. Each of the two sides of the metal partition plate **17** has a depressed slot **175**. Each of the two sides of the tongue **121** has a concave portion **1205** corresponding to the slot **175**.

The ground shielding member **19** is formed by bending a metal plate sheet, and is integrally formed with two grounding shielding sheets. Each of the two grounding shielding sheets has a first plate sheet **191** and a second plate sheet **192** forming a step. The two first plate sheets **191** cover the inner segments **1208** of the two connection surfaces of the tongue **121**, and the two second plate sheets **192** cover the top and bottom sides of the base **122** and are electrically connected to the metal housing **13**.

The bidirectional duplex USB TYPE-C electrical connection socket **1** also has the low-height connector design, as shown in FIG. **79**, wherein the total height of the connection slot **16** is about 2.56 mm, the height c of each of the symmetrical spaces on the two connection surfaces of the tongue **121** is about 0.93 mm, and the height d of the front segment (contact interface) of the tongue is about 0.7 mm.

Referring again to FIG. **78**, the electrical connection socket **1** and the electrical connection plug **2** of this embodiment can be bidirectionally electrically connected together in a duplex manner to achieve the effects of the doubled transmission and the convenient insertion and connection. That is, the contacts **44** of the two terminal sets of the electrical connection plug **2** are electrically connected to the contacts **141** of the two terminal sets of the electrical connection socket **1**. The tongue **121** of the electrical connection socket **1** is connected to the fitting space **77** of the electrical connection plug **2**. The two contact interface substrates **76** of the electrical connection plug **2** are fit with the symmetrical spaces of the two connection surfaces of the tongue **121** of the electrical connection socket **1**, the contact **643** of the ground shielding member **640** of the plug is electrically connected to the first plate sheet **191** of the ground shielding member **19** of the socket. In addition, the engaging projection **633** of the resilient fastener **632** of the plug engages with the slot **175** of the metal partition plate **17** of the socket, so that the plug and the socket form the mutual engagement thereinside.

According to the above-mentioned descriptions, this embodiment has the following advantages:

1. The plug and the socket can be bidirectionally electrically connected together in a duplex manner to achieve the effects of the doubled transmission and the convenient insertion and connection, and also have the low-height design to achieve the slim and light effects.

2. The insulating bases of the plug and the socket are configured as the vertically stacked upper and lower bases, wherein the upper and lower bases are embedded, injected and fixed to a terminal set, respectively, so that the convenience in manufacturing can be achieved.

3. The height of the engaging projection **633** of the resilient fastener **632** of the plug is greater than the material thickness of the metal partition plate **630**, and the resilient fastener **632** has a bent portion **635** to make the front segment and the rear end have a vertical step **635**, so that the middle height of the engaging projection **633** is substantially disposed at the thickness center of the metal partition plate **630**.

Referring to FIGS. **86** to **91**, a bidirectional simplex USB TYPE-C electrical connection socket **3** and a bidirectional duplex USB TYPE-C electrical connection plug **2** bidirectional correspondingly connected together according to the 18^{th} embodiment of the invention are almost the same as the 17^{th} embodiment. This embodiment provides chargeable male and female connectors, so the number of terminals of each contact interface is fewer (only five).

Referring to FIGS. **86** to **89**, the different between the bidirectional duplex USB TYPE-C electrical connection plug **2** and the 17^{th} embodiment resides in that each of the front segments of the upper base **301** and the lower base **302** of the insulating base **30** is integrally formed with the insulating layer **761** of the contact interface substrate **76**. The two sides of the two insulating layers **761** have two side plates **34** resting against each other. The two side plates **34** function as the positioning structure for positioning the interval of the two insulating layers **761** to form the fitting space **77**. Each of the two terminal sets has one row of five first terminals **40** respectively embedded, injected and fixed to the upper base **301** and the lower base **302**. The contacts **44** of the two rows of first terminals **40** having the same circuit serial number are arranged reversely, as shown in FIG. **88**, wherein the contacts **44** of the lower terminal set have the connection points with the circuit serial numbers of 1, 4, 5, 6, 7 arranged from left to right. The contacts **44** of the upper terminal set have the connection points with the circuit serial numbers of 7, 6, 5, 4, 1 arranged from left to right.

Because the connection points with the circuit serial numbers 1 and 4 are the ground and power terminals, respectively, the structure may be designed to have the wider plate surface, as shown in FIG. **89**. For example, the fixing portion **42** may be broadened to speed up the current conduction.

The two contact interface substrates **76** of the bidirectional duplex USB TYPE-C electrical connection plug **2** have the height "a" of about 0.8 mm, the height "b" of the fitting space **77** is about 0.8 mm, and the total height of the fitting portion **75** is about 2.4 mm.

Similar to the 17^{th} embodiment, the bidirectional duplex USB TYPE-C electrical connection plug **2** has a circuit

board and a rear shielding casing, wherein the circuit board electrically connects the connection points with the same circuit serial number of the two contact interfaces to the same circuit to form one set of circuits for output. Thus, it can work in conjunction with a bidirectional simplex electrical connection socket which can be bidirectionally correspondingly connected thereto.

Referring to FIGS. **90** and **91**, the difference between the bidirectional simplex USB TYPE-C electrical connection socket **3** and the 17^{th} embodiment resides in that the insulating base **12** is only embedded and injected to form a terminal set. The terminal set has one row of five first terminals **14**. The contact **141** of the one row of five first terminals **14** is in flat surface contact with the tongue **121** and exposed from an outer segment **1207** of the connection surface to form a contact interface **2***e*.

The bidirectional simplex USB TYPE-C electrical connection socket **3** is also the low-height connector design, the total height of the connection slot **16** is about 2.56 mm, the height c of each of the symmetrical spaces on the two connection surfaces of the tongue **121** is about 0.93 mm, and the height d of the front segment (contact interface) of the tongue is about 0.7 mm.

The male and female docking of this embodiment is the bidirectionally insertion connection, but is only the simplex electrical connection. So, in the combination of the plug and the socket, one has two contact interfaces, and the other has only one single contact interface.

Referring to FIGS. **92** and **93**, the 19^{th} embodiment of the invention provides a bidirectional duplex USB TYPE-C electrical connection socket **1** and a bidirectional simplex USB TYPE-C electrical connection plug **4** bidirectionally correspondingly connected together, and is almost the same as the 18^{th} embodiment except for the difference that, as shown in FIG. **92**, the bidirectional simplex USB TYPE-C electrical connection plug **4** is only embedded and injected at the upper base **301** to form one row of first terminals **40**. So, the upper contact interface substrate **76** has a contact interface **1***e*. As shown in FIG. **93**, the insulating base **12** of the bidirectional duplex USB TYPE-C electrical connection socket **1** is embedded and injected to form two terminal sets. So, each of the outer segments **1207** of the two connection surfaces of the tongue **121** is formed with one row of contacts **141** of one contact interface **2***e*.

The socket of this embodiment has two contact interfaces, so the socket is electrically connected to a circuit board. The circuit board may have cascaded circuits to electrically connect the connection points of the two contact interfaces of the socket with the same circuit serial number to the same circuit to form one set of circuits. Thus, it can work in conjunction with a bidirectional simplex electrical connection plug to perform the bidirectional corresponding connection.

While the present invention has been described by way of examples and in terms of preferred embodiments, it is to be understood that the present invention is not limited thereto. To the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.

What is claimed is:

1. A bidirectional electrical connection socket, to which a fitting portion of a bidirectional electrical connection plug can be inserted and connected, wherein the fitting portion has two contact interface substrates with the same height and facing each other and a fitting space, an interval between the two contact interface substrates is the fitting space, the bidirectional electrical connection socket comprising: an insulating base having one end connected to a tongue, each of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, the contact interface is formed by terminals, the terminal has a pin, a fixing portion and an extension, the fixing portion is fixed to the insulating base, the extension is connected to one end of the fixing portion, extends to the tongue and has a contact, the pin is connected to the other end of the fixing portion and projects beyond the insulating base, the contacts of the terminals form the contact interface; and a metal housing, which covers the tongue projecting beyond one end of the insulating base to form a connection slot, wherein the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, characterized in that the two contact interfaces have contacts of the same circuit arranged reversely and at least one pair of the contacts of the same circuit are connected together, each of two first fitting gaps respectively between the two contact interface substrates and an upper surface and a lower surface of the connection slot is smaller than 0.15 mm to form tight fit, and the heights of the spaces on the two connection surfaces are smaller than the large space of the standard electrical connection socket with the minimum height specification specified by USB Association, and are greater than the small space of the standard electrical connection socket, the standard electrical connection socket has a connection slot, a tongue is disposed in the connection slot in a vertically biased manner, two opposite sides of the tongue are formed with the large space and the small space, one set of contacts are disposed on one side of the tongue facing the large space.

2. The bidirectional electrical connection socket according to claim **1**, characterized in that each of the two contact interfaces has one row of at least five contacts projecting beyond the two connection surfaces, and each of the two contact interfaces has only one pair of signal contacts.

3. The bidirectional electrical connection socket according to claim **2** being one of (a) to (c) or a combination of more than one of (a) to (c):

(a) wherein the contact is vertically elastically movable or elastically non-movable;

(b) wherein each of the two contact interfaces has at least one pair or only one pair of signal contacts; and

(c) wherein each of the two contact interfaces has only one pair of USB 2.0 signal contacts respectively represented as D+, D−.

4. The bidirectional electrical connection socket according to claim **1**, characterized in that the contact interface has at least nine of the contacts arranged in one long row and one short row, and the two rows of contacts are in flat surface contact with and project beyond the tongue and are elastically non-movable.

5. The bidirectional electrical connection socket according to claim **4** being one of (a) to (h) or a combination of more than one of (a) to (h):

(a) wherein each of the two rows of contacts of the two contact interfaces have at least two long ones and seven short ones;

(b) wherein the at least one contact interface has at least three pairs of signal contacts;

(c) wherein the at least one contact interface has at least three pairs of USB 3.0 signal contacts respectively represented as D+, D−; RX+, RX−; and TX+, TX−;

(d) wherein the two contact interfaces have at least three pairs of signal contacts;

(e) wherein the two contact interfaces have at least three pairs of USB 3.0 signal contacts respectively represented as D+, D−; RX+, RX−; and TX+, TX−;

(f) wherein at least two of the longer contacts of the contact interface are arranged on two outer sides of the connection surface, respectively;

(g) wherein each of left and right sides of the connection slot has an engaging portion for engaging with the fitting portion of the bidirectional electrical connection plug; and

(h) wherein multiple portions of the metal housing perpendicularly corresponding to the two connection surfaces of the tongue are respectively hole-free structures.

6. The bidirectional electrical connection socket according to claim **1**, wherein the plastic base comprises an upper base and a lower base stacked together, and the upper base and the lower base are embedded and injection molded with at least one row of terminals of the terminals of the one contact interface, respectively.

7. The bidirectional electrical connection socket according to claim **1**, characterized in that the terminals forming the two contact interfaces are embedded into and injection molded with the insulating base and the tongue.

8. The bidirectional electrical connection socket according to claim **7**, wherein the terminals forming the two contact interfaces are concurrently embedded into and integrally injection molded with the insulating base and the tongue; or wherein the insulating base and the tongue form an integrated structure; or wherein the insulating base comprises an upper base and a lower base stacked together, the upper base is integrally provided with an upper segment region of the tongue, the lower base is integrally provided with a lower segment region of the tongue, the upper base is embedded into and injection molded with the terminals forming the one contact interface, and the lower base is embedded into and injection molded with the terminals forming the other contact interface.

9. The bidirectional electrical connection socket according to claim **1** being one of (a) to (n) or a combination of more than one of (a) to (n):

(a) wherein the two contact interfaces are the same contact interface;

(b) wherein at least one pair of the connection points of the two contact interfaces having the same circuit are electrically connected together;

(c) wherein at least one pair of the connection points of the two contact interfaces having the same circuit are electrically connected together through a connection medium;

(d) wherein the connection points of the two contact interfaces with the same circuit are electrically connected together to form one set of circuits;

(e) wherein ground and power connection points of the two contact interfaces with the same circuit are electrically connected together;

(f) wherein contacts of the two contact interfaces are not electrically connected together to form independent circuits;

(g) wherein the pins of the terminals of the two contact interfaces at least have one front row of pins and one rear row of pins, wherein distal ends of at least the rear row of pins are horizontal, or distal ends of the at least two rows of pins are horizontal; or wherein the pins of the terminals of the two contact interfaces are arranged in one row;

(h) wherein the terminals of the two contact interfaces are embedded and fixed with the insulating base and the tongue;

(i) wherein one end of the insulating base is integrally formed with the tongue;

(j) wherein the standard electrical connection socket with the minimum height specification specified by USB Association is a standard MICRO USB electrical connection socket, the height of the small space of the connection slot of the standard MICRO USB electrical connection socket is 0.28 mm, and the height of the large space of the connection slot of the standard MICRO USB electrical connection socket is 0.97 mm, so that the heights of the spaces on the two connection surfaces are greater than 0.28 mm and smaller than 0.97 mm;

(k) wherein each of the two contact interface substrates of the bidirectional electrical connection plug is provided with a contact interface, and the two contact interfaces of the two connection surfaces of the tongue and the two contact interfaces of the bidirectional electrical connection plug form duplex electrical connections;

(l) wherein the two contact interfaces are not lower than the two connection surfaces;

(m) wherein a middle of the insulating base has a transversally extending metal partition plate, and the metal partition plate separates the terminals of the two contact interfaces; and

(n) each of two second fitting gaps left after the two spaces are respectively fit with the contact interface substrates is smaller than 0.15 mm.

10. The bidirectional electrical connection socket according to claim **1**, further comprising an adapter medium adapted to a second electrical connector.

11. The bidirectional electrical connection socket according to claim **10** being one of (a) to (c) or a combination of more than one of (a) to (c):

(a) wherein the bidirectional electrical connection socket further has a connection point switching integrated device, so that the contact interface of the bidirectional electrical connection socket and the contact interface of the second electrical connector can be integrated and mutually switched;

(b) wherein the second electrical connector is a plug or a socket, which can be bidirectionally inserted for connection, and the second electrical connector has two contact interfaces or has only one single contact interface; and

(c) wherein the adapter medium is an adapter cable or a circuit board.

12. The bidirectional electrical connection socket according to claim **1**, characterized in that each of the two contact interfaces has at least two pairs of signal contacts electrically connected to at least two pairs of individual signal transmission circuits.

13. The bidirectional electrical connection socket according to claim **1**, wherein each of the two contact interfaces has one pair of signal contacts (D+, D−), and the same signal circuits of the two pairs of signal contacts (D+, D−) are electrically connected together.

14. The bidirectional electrical connection socket according to claim **1**, wherein each of the two connection surfaces

of the tongue is provided with contacts, which are arranged in a front-to-rear direction and comprises at least one row of contacts.

15. The bidirectional electrical connection socket according to claim **1**, wherein each of the two contact interfaces has one row of at least seven of the contacts, the two rows of contacts are in flat surface contact with the tongue and are elastically non-movable, the contacts on two sides are longer, and each of the two rows of contacts has only one pair of D+, D−signal contacts.

16. The bidirectional electrical connection socket according to claim **1**, wherein each of the two contact interfaces has one row of at least nine of the contacts, the two rows of contacts are in flat surface contact with the tongue and are elastically non-movable, the contacts on two sides are longer, and each of the two rows of contacts has at least two pairs of signal contacts.

17. The bidirectional electrical connection socket according to claim **1**, wherein each of the two contact interfaces has one row of at least nine of the contacts, and each of the two rows of contacts are in flat surface contact with the tongue, are elastically non-movable, and have at least two pairs of RX+, RX− and TX+, TX− signal contacts.

18. The bidirectional electrical connection socket according to claim **1**, wherein each of the two contact interfaces has at least two pairs of RX+, RX− and TX+, TX− signal contacts, and each of two pairs of RX+, RX− and TX+, TX− signal contacts of each of the two contact interfaces are signal contacts of independent circuits.

19. The bidirectional electrical connection socket according to claim **1**, characterized in that each of the two contact interfaces has one row of at least nine of the contacts, and each of the two rows of contacts are in flat surface contact with the tongue, are elastically non-movable and have at least three pairs of signal contacts, and the three pairs of signal contacts are RX+, RX−, TX+, TX− and D+, D−.

20. The bidirectional electrical connection socket according to claim **1**, wherein multiple portions of the metal housing perpendicularly corresponding to the two connection surfaces of the tongue are respectively hole-free structures.

21. The bidirectional electrical connection socket according to claim **1**, wherein a circuit board and a connection point switching device are provided, wherein the connection point switching device is electrically connected to and disposed on the circuit board, the duplex electrical connection socket is electrically connected to the circuit board, and switching of the duplex electrical connection socket is achieved by adopting corresponding circuit connection points for signal transmission through the connection point switching device.

22. The bidirectional electrical connection socket according to claim **1**, wherein a circuit safety protection device is provided, wherein the circuit safety protection device has at least one signal circuit processing element or circuit safety protection element, the circuit safety protection device is combined with an electrical element of the duplex electrical connection socket, and the circuit safety protection device ensures safety protection of circuit transmission when connection points of at least one pair of the same circuit of the two contact interfaces to be cascaded into one set of circuit.

23. The bidirectional electrical connection socket according to claim **1**, wherein heights of spaces of the two connection surfaces are not smaller than a height of a small space of an A-type standard electrical connection socket specified by USB Association.

24. The bidirectional electrical connection socket according to claim **1**, wherein the one contact interface has at least one row of seven contacts having connection points with circuit serial numbers arranged in order, and each of left and right sides of the connection slot has an engaging portion for engaging with an engaging portion of the bidirectional electrical connection plug to prevent the bidirectional electrical connection plug from detaching in a direction opposite to a docking direction.

25. The bidirectional electrical connection socket according to claim **24** being one of (a) to (d) or a combination of more than one of (a) to (d):

(a) wherein the contact is vertically movable or is in flat surface contact with the tongue and elastically non-movable;

(b) wherein the contact interface has at least one pair of signal contacts;

(c) wherein the contact interface has only one pair of USB 2.0 signal contacts respectively represented as D+, D−; and

(d) wherein multiple portions of the metal housing perpendicularly corresponding to the two connection surfaces of the tongue are respectively hole-free structures.

26. The bidirectional electrical connection socket according to claim **24** being one of (a) to (g) or a combination of more than one of (a) to (g):

(a) wherein the contact is vertically movable or is in flat surface contact with the tongue and elastically non-movable;

(b) wherein the contacts of the two contact interfaces are one row of long contacts and one row of short contacts;

(c) wherein the contacts of the two contact interfaces are one row of at least two long contacts and one row of at least seven short contacts, and the two rows of contacts are in flat surface contact with the tongue and are elastically non-movable;

(d) wherein the contacts of the two contact interfaces are one row of at least two long contacts and one row of at least seven short contacts, the two rows of contacts are in flat surface contact with the tongue and are elastically non-movable, and the at least two longer contacts are arranged on two outer sides of the connection surface, respectively;

(e) wherein the at least one contact interface has at least three pairs of signal contacts;

(f) wherein the at least one contact interface has at least three pairs of USB 3.0 signal contacts respectively represented as D+, D−; RX+, RX−; and TX+, TX−; and

(g) wherein multiple portions of the metal housing perpendicularly corresponding to the two connection surfaces of the tongue are respectively hole-free structures.

27. The bidirectional electrical connection socket according to claim **1**, wherein each of two contact interface substrates of the bidirectional electrical connection plug has a contact interface, wherein when the two contact interfaces of the two connection surfaces of the tongue are docked with the two contact interfaces of the bidirectional electrical connection plug, electrical connections are made concurrently to form dual-contact interface electrical connections, contacts of the same ground circuits of the two contact interfaces of the two connection surfaces of the tongue are electrically connected together, and contacts of the same power circuits of the two contact interfaces of the two connection surfaces of the tongue are electrically connected together.

28. A bidirectional electrical connection socket, to which a fitting portion of a bidirectional electrical connection plug can be inserted and connected, wherein the fitting portion has two contact interface substrates with the same height and facing each other and a fitting space, an interval between the two contact interface substrates is the fitting space, the bidirectional electrical connection socket comprising: an insulating base having one end connected to a tongue, each of two connection surfaces of the tongue has a contact interface to be electrically connected to the bidirectional electrical connection plug, the contact interface is formed by terminals, the terminal has a pin, a fixing portion and an extension, the fixing portion is fixed to the insulating base, the extension is connected to one end of the fixing portion, extends to the tongue and has a contact, the pin is connected to the other end of the fixing portion and projects beyond the insulating base, the contacts of the terminals form the contact interface; and a metal housing, which covers the tongue projecting beyond one end of the insulating base to form a connection slot, wherein the tongue is disposed at a middle height of the connection slot, symmetrical spaces are formed on two connection surfaces of the tongue, the fitting portion of the bidirectional electrical connection plug can be bidirectionally inserted into the connection slot, heights of the two contact interface substrates can be fit with the spaces on the two connection surfaces of the tongue, the fitting space is fit with the tongue, characterized in that the two contact interfaces have contacts of the same circuit arranged reversely and at least one pair of the contacts of the same circuit are connected together, each of two first fitting gaps respectively between the two contact interface substrates and an upper surface and a lower surface of the connection slot is smaller than 0.15 mm to form tight fit, and the heights of the spaces on the two connection surfaces are smaller than the large space of the standard electrical connection socket with the minimum height specification specified by USB Association, and are greater than the small space of the standard electrical connection socket, the standard electrical connection socket has a connection slot, a tongue is disposed in the connection slot in a vertically biased manner, two opposite sides of the tongue are formed with the large space and the small space, one set of contacts are disposed on one side of the tongue facing the large space, wherein each of the two connection surfaces of the tongue has an inner section formed with an inner section surface, and an outer section formed with an outer section surface, the inner section surface being a distance away from the plane of the outer section surface to form connection surface with steps.

29. The bidirectional electrical connection socket according to claim **28**, wherein each of the inner section surfaces of the inner sections and the outer section surfaces of the outer sections of the two connection surfaces of the tongue has at least one ground contact; or multiple contacts of at least one row of terminals of each of the two contact interfaces are respectively in flat surface contact with and positioned at the outer section surfaces of the outer sections of the two connection surfaces; or each of two second fitting gaps left after the two spaces are respectively fit with the contact interface substrates is smaller than 0.15 mm.

30. The bidirectional electrical connection socket according to claim **1**, wherein the insulating base comprises an upper base and a lower base stacked together, the upper base is integrally provided with an upper segment region of the tongue, the lower base is integrally provided with a lower segment region of the tongue, the upper base is embedded and injection molded with multiple terminals forming the one contact interface, the lower base is embedded and injection molded with multiple terminals forming the other contact interface, and the multiple contacts of the two contact interfaces respectively project beyond the two connection surfaces of the tongue.

31. The bidirectional electrical connection socket according to claim **30**, wherein the multiple terminals of the two contact interfaces have extensions, which have inner sections embedded into, injection molded with and fixed to an inner section of the tongue, and outer sections embedded into, injection molded with and fixed to an outer section of the tongue and exposed from outer sections of the two connection surfaces, wherein the outer section of the extension has the contact.

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